OBSERVATIONS

ON THE

MAGDALEN ISLANDS

BY JOHN M. CLARKE

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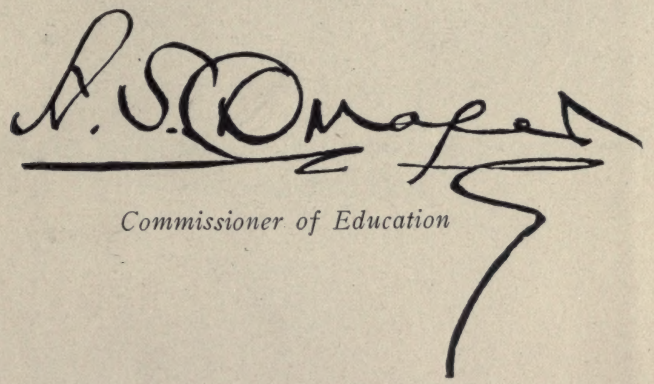

Commissioner of Education

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Plate I

Magdalen islands. Shore cliffs on Alright island; showing the contrasting colors of the soft and hard sandstones and the "demoiselle" topography.

OBSERVATIONS ON THE MAGDALEN ISLANDS

The Magdalen islands, lying in the very heart of the Gulf of St Lawrence, are a chain of disjected and sea-wracked remnants of continental land, standing today as they have stood since the beginning of navigation in these turbulent waters, a fearful menace to the sailor and his craft. The chart shows them stretched out like a long key lying crosswise of the waters in a direction which corresponds to the general northeast-southwest course of the basal rock folds and depressions which govern the fundamental contour of all the lands of the lower gulf. If the eye will follow the 20-fathom line on the chart, it will be seen what a tremendous platform has been carried away by the waves in the gradual wasting of the land to this slight depth and what slender, broken remnants of it now remain above the water line. A 20-fathom elevation to the water line would throw all the chain of islands into one land mass and leave them as slight elevations along the rib of a broad plateau which, altogether, would present many hundred times the area of the land now remaining. Even the 10-fathom line sweeps about all the islands, tying them into one, and reaches out to take in Brion island at the north and the Great and Little Bird rocks further east; so that if the water might stand now at this 10-fathom line, or in the days when it did so stand, the broader Magdalen island would stretch its key out into a long, slender and gracefully curved handle.

Today these islands differ only from the isolated rocks of Brion and the Birds by being fringed with sand spits and dunes and tied to one another by tremendous sand bars, which the seas at the east and the west have piled up into a double chain, leaving between the great interior lagoons, Basque harbor, House harbor, the Great Lagoon and its branch at the extreme north behind the dunes of Grosse Isle and East point. Thus the sea has tried to bury the remnants of its own destruction, tossing back to these feeble fragments of the land its very ruins.

Compared to the area of the Magdalen group as it appears on the chart, the actual area of rock land is small and resolved into little insular units of soil and of population. *Entry island* stands at the eastern terminus of the chain and faces the entrance to Pleasant bay, sometimes the least, and sometimes the most dangerous harbor on all the coast. Westward and separated from Entry by the tremendous spit of Sandy Hook is *Amherst island,* whose harbor and

landing at the little triangle of Mt Gridley the eye will barely catch except by close inspection of the chart. This little spot of rock is really cut entirely away from the island proper, but a sand bar leads across to Demoiselle hill and beyond this narrow neck of actual land the island widens out, extending east and west for nearly ten miles across, broken by demoiselle hills which have a trend parallel to the northeast course of the island chain. The two great bars which run north from Amherst and inclose the Basque harbor are cut across by tickles or gullies too narrow to make a passage except for the smallest craft at high water; but the inhabitants drive along these bars from island to island fording the tickles as best they can — always a perilous passage if the sea outside is heavy. Reaching out with these two arms Amherst clutches *Grindstone island*, an almost circular land mass with high shore cliffs on nearly every side, and again an interior of rounded demoiselle elevations, the nature of which we shall presently refer to. Then from Grindstone two arms again extend north and eastward.

At the west is the immense bar reaching 27 miles from Hospital cape to *Grosse Isle* inclosing midway of its course the little rock fragment, *Wolf island*. At the east Grindstone is separated from the land next north, *Alright island*, by the tickle which leads into House harbor, the best of the land-locked roadsteads of the island, and ferriage is necessary to reach the south end of the crescent-shaped film of land which makes Alright. This island is little else than a row of beautifully rounded demoiselle hills whose grassy green summits and gray sides form a brilliant contrast with the low-lying platform of red rocks at the water's edge. Perhaps two-thirds of the area represented on the map as constituting Alright island is rock land; the rest is sand and the great eastern bar here runs its course, passing the little rock called *Shag island*, on to the northeast until it is broken across by the Grand Entry, the broad tickle leading into the northern expansion of the Great Lagoon. This, too, is good harborage but the vessels in heavy sea or low tide rarely take the risk of running it. I have waited eight hours on the sands of Grand Entry for the coast steamer standing in the offing with an east wind and a falling tide, to muster courage to run the passage. From Grand Entry to Old Harry point is another sickle-shaped bit of land, cut into and perhaps in two or three by sand-covered passages. This is *Coffin island*, and on the sea front from here around to East point, the farthest tip of the islands, and back again to Grosse Isle, there is no rock land — all is a vast stretch of high duned sands. Behind these sands and facing the lagoon is the bit of land called

East island, with its high half-ruined North East cape which peers out far over the sands and is the first point of the islands that confronts the traveler from the north. There remains in this chain of sand, Grosse Isle, a divided island, one single hill standing out on the west coast as North cape, the rest a headland, Grosse Isle head, facing in a long escarpment the interior lagoon.

It is an instructive feature in the structure of these islands that the northern lagoon both south and north abuts against so many steep bare cliffs. The waters of this great lagoon are shallow and navigation in them is closely restricted to a narrow sinuous channel through whose course the navigator is guided by a staked way. These waters could not in their present condition have contributed to the downfall of the rock cliffs; the interior cliffs were made in days before the lagoon existed or its sands were heaped up to cut off the outer sea.

These bits of land which constitute the Magdalens have been saved from total destruction by the slow elevation from the sea in later stages of their history which has given birth to the sands, and extended them over the wasted plateau which the waters themselves have created. I should not say that this was a recent effect, for these great sand bars are often a mile or more across from water to water and the dunes which cap them may be 100 to 150 feet in height, while their mobility is restrained in part by caps of bunch grass and stunted spruce. The islands and their sands are the ruin wrought by the sea; so they in their turn have wrought terrific ruin to sailors and sail from the time the Europeans began to throng the gulf. Their long, low, dark coasts and treacherous bars have lain like a trap for the unwary navigator; and when beating out of his course for the channels at the north or the south or in times of stress when the northeast or northwest seas were driving against the rocks and sands, hundreds of craft have gone ashore on these unlighted cliffs; the bleaching ribs of dead ships are seen on all the coasts, and tales of shipwreck make up much of the history of the islands.[1]

Of the islets that lie off the chain only one — *Deadman's island,* a sarcophagus of rock a few miles west of Amherst — is noteworthy and that for its history and associations. It was gruesomely

[1] Many of the inhabitants are castaways and M. Brassette, the venerable postmaster at Amherst, has told me that within his time there have been, he thinks, not less than five hundred ships, great and small, cast upon these islands.

sung by Thomas Moore, was the Isle d'Alezay of Cartier's first voyage (1534) and is the Corps Mort of the French. Of the larger islands at the north *Brion* lies ten miles away from Grosse Isle, a block of rock three miles long with sheer walls on nearly all sides, and the *Bird rocks,* famed for centuries for their myriads of waterfowl, lie twenty miles from Grosse Isle. These and their feathered dwellers, the gannets, murres and puffins, kittiwakes and razorbilled auks, have been the subject of many romantic bird tales, the object of numerous marvelous camera sketches, but the geology of these little rocks is simple and of a piece with that of the other fragments of the plateau. The tragedies of human life on this isolated crag of the Great Bird, where reason has often given away to madness and living has fallen foul of death in the keeping of the light, have not been told to the world.

HISTORY OF THE ISLANDS

It is not to be supposed that such tattered fragments of the earth as these islands could have played any large part in the caravan of human events in the western world. Yet each place has been a factor in the progress of discovery at least, and in this these islands have their share. Their intimate history has never been written and perhaps there is no good reason why it should be. Certainly this is not the place in which to set forth even so much as the writer has been able to bring together from the records of explorations and the journals of the early navigators. So much only as is appropriate to the occasion is here put down.

Jacques Cartier was the first European to see these islands, so far as we know. In his first voyage, that of 1534, his course lay southward from the straits of Belle Isle and he made these rock lands in succession from the north; first the Bird rocks, which he named the *Isles aux Margaulx,* then Brion island, to which he gave the name of the first Admiral of France, Philipe Chabot, Sieur de Brion. Here he went ashore and of it he wrote such a glorious description as to make the reader feel he had found a paradise on earth. Some of the later voyagers applied this name, Brion, to the entire group of islands, but Cartier in his second voyage speaks of crossing over from Brion island, which he revisited, to *Les Araynes* — the sands of Grosse Isle and East point. By this name and its variants the group was set down on many of the earlier charts. The charts of the gulf which date from soon after Cartier's voyages, those of Desliens, 1541, Des-

celiers, 1546, 1550; Champlain, 1609; Mason, 1626, and others, are not altogether reliable historical records but are of interest in showing the growth of ideas concerning the form of the islands, and their changes in name, their years of confusion with the Isle St Jean (Prince Edward Island) and their gradual distinction from it. Indeed few if any of the charts to Champlain's time and later made out the Isle St Jean, 50 miles to the west of the Magdalens. We do not know how soon after Cartier's discovery the Normandy and Breton men got in among these islands, but by the latter part of the 17th century the stories they brought home of the tremendous number of seals and walruses to be had, reached England, and started English expeditions into this quarter. There was a voyage made in 1591, by a skipper unknown, on behalf of M. de la Court, Pré Ravillon and Grand Pré, for the purpose of killing "Morses" for "traine oyl" (see Hakluyt's Voyages, v. 8, p. 150), which of itself indicates previous attempts by the French for the same purpose. Then the English attempts upon the islands began, and George Drake made a passage in 1593, finding the harbors occupied by "Britons of S. Malo and Basques of S. John de Luz." Drake found that "by coming a day after the Fayre" his efforts were put to naught; just as Charles Leigh and Sylvester Wyet, who with Drake were the first Englishmen to sail so far within the gulf, are said on their arrival to have been confronted by two hundred French, who had planted three pieces of ordnance on the beach, and three hundred savages — an opposition which led to a sharp sea fight and seems to have effectually dissuaded further attempts on the part of the English to fasten their hold on this business.

These islands were granted in 1653 by the Company of New France to Nicolas Denys as a part with the vast region stretching from Cape Canso at the south to Cape des Rosiers at the north, and the next year Denys received from the king letters patent as governor and lieutenant general to all this great territory. Even today the Magdalen islands belong to Gaspé county and the Province of Quebec. In those early days land patents in the world of New France were given easily and conflicting claims to the same territory issued from the same source often resulted. So it happened that in 1663 the Company of New France conceded these islands to François Doublet of Honfleur, who was commissioned to establish a colony on the "illes de Brion" for the cod and seal fishery. Doublet was also given per-

mission to change the name of the islands from Brion to *Madeleine,* which was the name of his wife. So this name has come down to the present, a memorial of conjugal devotion, though Doublet's attempts at settlement failed totally and have been almost forgotten.[1]

Like Doublet, Denys failed in his efforts to induce colonization and in 1720 the islands with S. Jean and Miscou, were conceded by letters patent to the Count de Saint-Pierre, Equerry to the Duchess of Orleans. He was commissioned not alone to carry on the fisheries but to cultivate the soil and cut the timber. So far as we know the attempted colonization under this patent effected little and the islands were lost sight of until after the fall of Louisburg and the evacuation by the Acadians of Grand Pré and other settlements when many of the homeless families came here and here their descendants today constitute the majority of the population. In 1763, after the fall of New France, the English government annexed the island to Newfoundland, but by the Quebec Act they were soon after attached to that province where they now belong.

A new era in their history, however, began in 1798, when they were granted by George III under letters patent to Admiral Isaac Coffin, in recognition of his service during the American war and the new proprietor established there a feudal system of land tenure which has remained close to the present day as the last flickering expression of medievalism in the English lands of the western world. Sir Isaac Coffin required the occupants of the islands to take titles in the nature of perpetual leases at an irredeemable rent or emphyteutic leases. The islands cover nearly 100,000 acres and at the usual return of 20 cents per acre per year this would have produced a considerable ground rent

[1] They probably would be entirely forgotten if it were not for a short, sharp passage in Denys's Description Gèographique et Historique des Costes d l'Amérique Septentrionale, 1672, and had not the departmental archives at Rouen afforded in recent years the manuscript journal of Doublet's son, which was edited and printed in 1883 by Brèard, under the title *Journal du Corsaire Jean Doublet de Honfleur.* This is a remarkable story of a freebooter's life in every quarter of the watery globe, beginning with his successful attempt, at the age of seven, to stow himself away aboard his father's ship which came out to the Madeleines in 1663, the experience of the colony there, the return next year to find the colony demoralized, the place abandoned and the venture wholly lost. Only the name of the islands has remained to record in the geography of the place the first attempt at permanent settlement.

Plate 4

Magdalen islands. Shore cliffs on Grindstone island in the low lying platform of red Permic sandstone. The line of decolored white sand is everywhere conspicuous and in the foreground a layer of angular diabase pebbles is visible beneath the white sand.

but it never proved collectable, and the system resulted in continued contentions between agent and tenant and at times in considerable migrations from the islands.

In later years the attitude of the seignieur has been more lenient, property may now, under specific law, be acquired in fee and the population has grown to nearly 7000 people, chiefly French who occupy the larger islands, Amherst, Grindstone and Alright, while the English communities are on Entry, Coffin and Grosse Isle. A few years ago the seignieurial rights of the Coffin heirs were acquired by the Magdalen Island Development Company, and the feudal land tenure seemed to have at last become extinguished. In their efforts to develop the islands this company erected extensive fish houses and equipped the islands with gasolene boats for the fishing, but these efforts do not seem to have aided the people or the productiveness of the islands and it is understood that the property has never entirely left the possession of the Coffin heirs.[1]

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[1] A very interesting account of the land tenure on the islands forty years ago was given by Faucher de Saint-Maurice in his *Promenades dans le Golfe Saint-Laurent* (1874, p. 167). This account is not fully pertinent to the existing conditions and must be regarded as slightly colored by the author's sympathetic interest in the Acadians; but it is out of such feudal tenure as is here pictured that the present state of land and freehold has evolved:

With little regard to the right of the first settlers the English Government committed an act of irreparable injustice. It struck a death blow at the development and future of this charming archipelago, which the sailor has picturesquely called *le Royaume du Poisson*. And so ever since that fatal date, August 24, 1798, the inhabitants of the Madeleines, knowing that they could never own their land, have exerted themselves only so much as necessary to make a living and they know only by hearsay the enjoyment of proprietorship and the love of the soil.

So sad a condition of affairs finally aroused the Provincial Government of Quebec. Sixty-six years after the concession of the islands a commission was charged by Parliament with an inquiry into the land tenure of the archipelago. Fifty-two inhabitants of the Madeleines hastened to answer a series of printed questions which were distributed among the people. Some had lived on the islands for twenty-five, thirty-five and forty-five years; others fifty, fifty-five and sixty years. Only one of these, Jean Nelson Arseneau, was born there, and the dean of the residents was Bruno Terriau, who had lived in the group sixty-six years. All declared that they held their lots as tenants by virtue of long leases and their replies made some curious revelations to the Government.

Thus some of the settlers had billets of simple location which gave them the right to take a lease from the proprietor, while others had a lease for ninety-nine years. Those who had held a lease for fifty-two years had the right to make it continue, and holders of a lease during ten years, to exact a permanent lease from the proprietor. The last procedure did not seem very pleasing to the agents of Admiral Coffin and all agreed that it was gradually

Convincing clues to the history of a country are embalmed in its place names. I have here given the principal names on these islands with suggestions as to their origin.

Madeleine
Magdalen } English } Named for Madeleine Doublet, wife of François
Magdalene } Doublet, 1663.

Maudlin — broad French and vulgar English.

Brion
Bryon } on most English maps { This name, applied by Cartier, 1534, to the
Byron } island now bearing it, was often used by early explorers for the whole group. It was given in honor of Philipe Chabot, Sieur de Brion.

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disappearing, for whenever the opportunity presented, the agents changed these leases about.

Generally these leases contained clauses which permitted the seignieur of the islands to take over the lands, to take advantage of their improvements and to possess himself, without reimbursement, of the house and buildings if by some ill-luck the tenant could not fulfil the terms of his lease. It was thus that two of the descendants of the oldest settlers of the Madeleines, Louis Baudraut and François Lapierre, were compelled, after many years of hard work and privations, to abandon to Admiral Coffin the land where their ancestors had lived and which their children had improved to the best of their ability.

This is the way in which Fabien Lapierre was not quite stripped of all his possessions. This man having decided in 1863 to explore the north coast of Labrador, left the land he had occupied for twenty-five years to the care of two of his compatriots, Basile Cormier and Emile Morin. They were to hold it on condition of keeping it up, paying the rent and turning it back to him on his return. For the first year everything went well. The agent consented to take the rental from Lapierre's proxies; but after the beginning of the second year he refused their money, took possession of the land, cut the hay, forced open the house and stored it with the crops for winter use, and afterward sold the whole, land and dependencies, to Desiré Giasson. The following year Lapierre returned and claimed his property. In reply Coffin's agent threatened him not to obstruct the cutting of wood and told him if he continued to make trouble, he would chase him off the islands. But finally by his own pleas and the help of his priest, the Abbé Boudreault, the poor man succeeded in recovering a part of his land on the condition of consenting to a new lease which obliged him to pay annually a shilling an acre. The rest of his property remained and is yet in possession of the purchaser Giasson who has claimed legal title to it by the payment of five pounds. It is not difficult to understand the evils which such a régime imposes on the archipelago and some of the inhabitants, shaking off their torpor, have undertaken to test before the Circuit Court of the Madeleines the titles of Admiral Coffin. Some plead the law of limitations, others allège the illegality of the leases and their burdensome tenure, as contrary to the colonization and progress of the islands. The more philosophical state that for nearly a century their forefathers had cultivated these lands in full ownership, while their descendants and legal heirs can occupy them only as tenants; and the more equivocal say that their ancestors never consented to the title of Admiral Coffin. All these complaints accomplished nothing. The court decided in favor of the proprietor and as most always happens the complainants who perhaps had a chance on appeal from this decision were not able, for lack of

Plate 5

Havre Aubert, Amherst island. Mt Gridley in foreground, "Fishtown" (sandbar) in center and Demoiselle hill in distance; Pleasant bay at the right (east) and the "Basin" at the left.

Amherst island. Mt Gridley from the face of Demoiselle hill; English church on the sky line and Entry island in the distance.

Ramèes
Ramea
Ramies

Champlain applied the name *Ramèe-Brion* to the entire group, Ramèe having reference to the way in which the islands are strung together by bars. The name was in use before Champlain's time as it appears in Fisher's narrative of 1591 and Drake's, 1593: "Called by the Britons of S. Malo the Isle of Ramea."

Les Araynes
I. des Arenos
I. des Arenes
I. aux Sablons
I. aux Sabloens
I. Duoron

Cartier, in his second voyage, speaks of crossing over from Brion to the sands, "les araynes," meaning the sands of Grosse Isle and southward. The name appears on early charts in the alternative forms given and applied to all the group except Brion and Alezay.

Entry I.
I. de l'Entrèe

A very early name, though evidently not Cartier's. It guards the southeastern portal of the group.

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money, to go to a higher court. So matters take their course. Apathy and discouragement reign supreme in the islands which only await the coming of a new régime to become a storehouse of abundance. The tenants continue to pay local and school taxes while their lord and master rigorously exacts the annual rental of the lands — rents which are exorbitant compared with those elsewhere. Nevertheless in the midst of this secret discontent, some of the old settlers find a way to be satisfied with their position. Many of them have a hundred acres under cultivation for which they pay annually only five shillings or a quintal of cod. These are the kings of the isles and they are the envy of those about them; for a young settler who wishes to rent the same amount of land uncultivated and unwooded would be obliged to pay twenty cents a year per acre. Fulfilling this condition he becomes a tenant. For a while youth, ambition and love of work let loose their forces. Under his plow the desert becomes fertile fields. The fish help to make good his deficit. He will be able to live comfortably and be happy though only a tenant. But bad times come, the rent is behind; then come the threats of the agents. The demon of expropriation hovers over his little property; nothing remains to the unhappy man but exile or servitude.

It is not surprising that nearly all this population which otherwise might be enterprising and rich live here, half asleep and in poverty. Strangers flee from this nest of feudalism. These vexatious conditions have resulted in a large migration from the islands to Labrador. More than three hundred heads of families have left the islands and established themselves at Kekaska, Natashqouan and Esquimaux Point. These departures have weakened the population of the islands. Every year large numbers go to join those that have already left and it looks as though in the near future the islands may become entirely deserted.

The remedy for the condition pictured here has been found in legislation by the Quebec Parliament which enacted a law in 1895 (Statutes of Quebec, 58 Victoria, Cap. XLV) regulating the form of the land tenure, declaring outstanding occupants to be proprietors subject to payment of rentals and insuring the right of redemption of capital. This law seems to have brought a much desired confidence and sense of security to the islanders without detracting from the income of the seignieur, who now being an heir and substitute of the original proprietor, had, it seems, no legal right to alter the form of the first leases. The province has still further alleviated the condition of the islanders by assuring in amendments to the law cited (59

Amherst I.
I. Aubert
Hâvre Aubert — Gen. William Amherst — a name given by the Coffin patentees. The old French name is Hâvre Aubert and this is the post office name today. Aubert was commissioner for the islands at an early day and the "Hâvre" has reference to the interior lagoon which has been at various times open for small vessels.

Pleasant bay
Baie au Plaisance — The broad bay on the east coast of Amherst, a deadly anchorage in an easterly gale.

Cabin cove
L'anse aux Cabanes — On the south shore of Amherst. Has reference to Micmac lodges there at an early day.

West point
Sou'west point
Sou'west cape — On Amherst.

Mt Gridley — The little triangle of land at Amherst wharf. Gridley was an American who established the first lobster fishing here about 1763.

Demoiselle hill — On Amherst. Takes its name from its symmetrical shape which the French thought resembled a maiden's breast, in which respect it is like all the volcanic-gypsum hills on Grindstone, Alright and Entry.

Basque harbor
Harbor Basque
Hâvre aux Basques — A name dating to the 1600's when the Basques were in possession.

Grindstone I.
Pierre Meulière
Isle aux Meules
Isle Blanche — The English name translates the French; all are due to the coarse white sandstone which forms the principal headland, Cape Meule.

Leslie cove — Named for William Leslie, early pioneer of the lobster business, and still there after 40 years' residence. This is the post office name of the eastern part of Grindstone I.

Red cape, Grindstone I. Its blood-red sandstones.

Cape le Trou — Grindstone I. Stands on the hydrographic chart but does not seem to be known to the residents.

Vic. Cap. XXXVIII, 1895, and 60 Vic. Cap. XIV, 1897) a repayment to the tenant of one-third the amount necessary to effect the freehold.

While writing this note, I am informed of a new organization, the Eastern Canada Fisheries, Limited, which is reported to have taken over all the assets of the insolvent Magdalen Islands Development Company and which proposes to take full advantage of the great natural wealth of the sea in those islands.

Plate 6

Demoiselle hill, Amherst island

Red sandstones carrying in the upper part, just under the soil and embedded within the sand, an irregular layer of angular diabase pebbles. The sandstones are horizontal, the apparent cross bedding being a secondary structure. Grindstone island

Hospital cape
Cap au hopital — Grindstone I. The origin is lost both to the French and English, but the name naturally suggests a wreck and rescue.

Etang du Nord — Grindstone I. Pronounced by the English, *Tantanour*. The *pond* is the north pond of Basque Harbor.

Alright I. — Sailor's term. Not older than the Coffin patent. Either this or Grindstone I. was called Saunders I., by Bayfield or the Coffins.

House harbor
Harbor Maison
Hâvre aux Maisons — The harbor between Grindstone and Alright. An ancient term referring to early settlement, probably the first on the islands.

Shag I. This is a bird roost and a shag is a cormorant.

Grand Entry — This passage between Alright and Coffin island seems to have been in use from the days of the Basques and Bretons. It was, I believe, the harbor called by Leigh, 1591, Halobolina, and was mentioned by Cartier.

Pointe Basse — The steamer landing at Alright — not on chart. (Pointe Basque?)

Coffin I. Named for the proprietor, Sir Isaac Coffin.

Old Harry head, Coffin I. Probably of like date.

Grosse Isle — The Great Island of the Magdalens or the Great Magdalen of a few English writers. One of the smallest of the group but connected by vast sands with all the other land at the north.

North cape — This is the Cap au Dauphin of Cartier, a name still in use among the French.

Bird rocks
Isle aux Margots
Isle aux Margaulx
Isle aux Oiseaux — The last two are Cartier's names, 1534. The Rocks are separated into North or Great Bird (140 acres) and the Little Birds, two in number.

Deadman's I.
Corps Mort
Alezay
Alezai — Seven miles west of Amherst. Alezay is Cartier's name.

TOPOGRAPHY AND GEOLOGY

Surface modeling. Though the islands are not commanding in bold contrasts of contour, their scenery is inviting and unusual. Rock platforms of dark purple-red bound the lower levels of the coast, broken by higher cliffs of volcanics or of gray sandstone where the sea has cut into the rounded hills. The division in the topography is, in respect to cause, threefold: the sands,

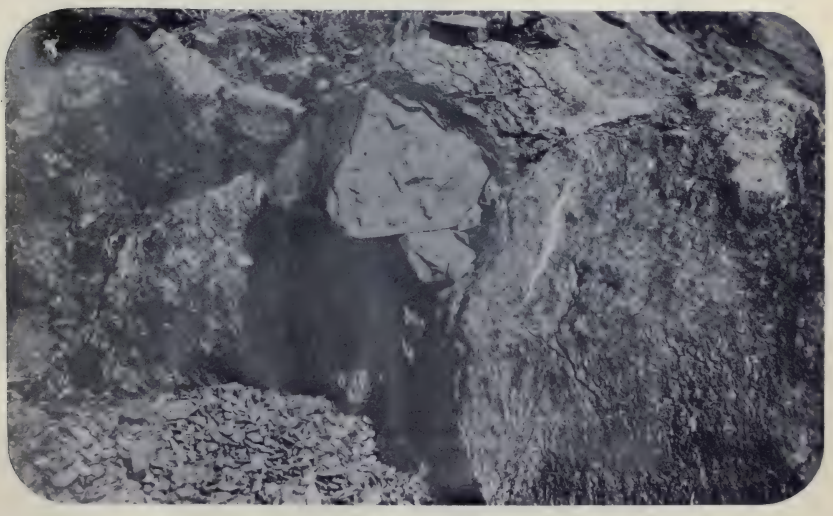
the rock platforms and the volcanic-gypsum hills. To the first is due, of course, the present outline and extent of the charted islands and in them are to be found brilliant illustrations of the process of deflation — dune building and anchoring, rock etching — and, further, evidence of the slow upward lift of the islands save perhaps at the southeast. By the rock platforms are meant the low flat-topped rock lands which skirt the rounded hills and reach the coast line in level surfaces and low red fronts of 50 feet or so. The hills are all of one type and I propose to speak of them as *demoiselle hills;* rounded, symmetrical, beehive-shaped elevations with grassy surfaces and separated by shallow or deep cauldronlike depressions. They are the ribs of the islands presenting not only higher but much more resistant fronts to the attack of the sea than the soft crumbling platforms of red sandstone. Their height varies from 580 feet, St Lawrence hill on Entry, down to the knolls and knobs on Grindstone and Grosse Isle, some of which are no higher than the dunes upon the beaches.

These many breasted islands proclaim their neglected fertility and trumpet their virgin claims in the unheeding ears of their fisher folks, whose thoughts are only of the sea. It has perhaps still to be demonstrated that the demoiselle hills have all a like origin. The Demoiselle on the shore of Pleasant bay at Amherst is a volcanic-gypsum knob (and by this term, which I shall endeavor to explain more fully, is meant an association of gypsum with volcanic effusions and debris), those on Grindstone are mostly of the same order, but Cape aux Meules on Grindstone and Pointe Basse on Alright are gray sandstone knobs in which the presence of either volcanics or gypsum has not made itself evident at the surface, whether or not those may lie at the root of them. The general landscape effect of the islands is well shown in the accompanying panorama view, extending from Cape aux Meules on Grindstone (left) northward to the outermost tip of Alright. The tickle into House Harbor enters the middle distance, the rock front at the left is gray sandstone, the hills next north the volcanic-gypsum series traversing Grindstone, and the rounded tops of Alright beyond lie scattered among the half-disclosed gypsum masses.

Rocks. In a broad sense the rocks of the islands are gray, hard, schistose sandstones, sometimes slightly mottled; brilliant purple-red or blood-red soft sandstones; volcanic masses in the form of diabase sheets, accompanied by agglomerations of

Plate 7

A mass of gypsum filled with angular blocks of diabase. Grindstone island.



Block of diabase entirely surrounded by massive gypsum. Grindstone island.

Plate 8

Red sandstone cliffs at Leslie cove, Grindstone island

tuffs, permeated by thin seams and sheets of gypsum and followed along their faces by enormous gypsum deposits. The rock geology of the islands has received attention only once and then in a careful though brief report made by Mr James Richardson for the Dominion Survey during the summer of 1880, just 30 years ago, and published in the Geological Survey of Canada, report for 1881.[1] Mr Richardson's keen insight into the relations of these rock masses is a noteworthy characteristic of his work, even though he frankly left many questions to be illuminated.

Stratigraphy. The only detailed section of these rocks given by Richardson is taken from the sea front of Amherst island on Pleasant bay and extending along the escarpment of Demoiselle hill. This section of 856 feet (measured) shows that the hard gray and mottled sandstones lie at the bottom and the soft deep-colored red sandstones above. Yet a change of dip between the lower and upper masses suggests a disconformity and necessarily qualifies the assumption of vertical succession. At the base of this whole sedimentary series lies a mass of partly compact but for the most part badly broken volcanics with an extensive deposit of gypseous clay and an agglomeration of both together. This seems to make the base of the section and produces the curves of Demoiselle hill.

This section of the sedimentaries is typical for the islands Grindstone and Alright, where there is opportunity for adequate exposure. Probably the east shore of Grindstone affords a more favorable and longer section than any other as here is a clean coast line from House Harbor at the north to and beyond Red cape at the south. Here it is seen that the red sandstones which cover all the shore section from just south of Cape aux Meules to Red cape, are, as everywhere else, quite horizontal, and they make a broad flat fringe about the rather distant elevated interior. The sea has cut into them like a mouse into a cheese, carving their frontage into marvelous and bewildering zigzags, aisles and obelisks. Following these red beds north to the cape, they pass without evident loss of conformity or continuity into the gray hard sandstones which make the "Meules." This apparent continuity of the soft red and hard gray series is often seen and I am disposed to believe an approximate explanation of it is to be found in the almost invariable presence with the gray sandstones, when elevated into demoiselle hills, of the vol-

[1] Report of a Geological Exploration of the Magdalen Islands, p. 1-11 G.

canic-gypsum masses. I fancy there is little to militate against the conception that these volcanic lavas with their sulfur and other gases have not only indurated the sands and thus made them more resistant to meteoric downwear, but have decolored them by rendering the iron oxid soluble. On Grosse Isle Head like conditions are exhibited on a small scale, but more effectively on Alright island where all the demoiselles display the hardened gray sandstones.

Shales and limestones are of the rarest occurrence, but where they have been observed the shales, when calcareous, carry fossils. Where the great gypsum deposit of Grindstone, stretching nearly east and west across the island from north of Cape aux Meules, reaches the vicinity of Cape le Trou, there are fossil-bearing brown bituminous limestones with goniatites and pelecypods, lying close against the white outstanding gypsum cliffs. A few fossils have also been found near House Harbor along the gypsum masses exposed on the property of the Widow Arseneau. At Grand Entry I observed lying among the piles of "killicks" on the beach many blocks of gray calcareous shale with fossils in them and inquiry of the fishermen brought me to the outcrop of this rock at Oyster basin on Coffin island. Mr Richardson reported but one locality of fossils, that on the sea face between Cape aux Meules and House Harbor. Those I have obtained at the three localities mentioned, amounting in all to a very considerable quantity of material (10 barrels were brought away from the Oyster basin locality) I have placed in the hands of Dr J. W. Beede, who has very kindly undertaken to examine and report upon them. Their evidence is, of course, ultimately essential to the determination of the geological age of these formations.

Doctor Beede's conclusions indicate that the marine fauna is of early Carbonic age, to be paralleled in horizon with the Mississippic of the interior basin yet with palpable evidence of development in an Atlantic basin isolated from the interior by the appalachian uplift. All the outcrops which have produced this marine fauna lie very clearly at the base of the sedimentary rock series of the islands, beneath the gray and red sandstones. As to the red sandstones there is no reason to assume any lack of continuity with the similar beds of Prince Edward Island. These have commonly passed as "Triassic" rocks and Leidy, Dawson and Dana believed that this age was effectively determined by the discovery in that island of the reptilian remains which were determined as the lower jaw of a dinosaur.

Plate 9

Grosse Isle, from the dunes at the north; showing almost the entire island and fishing settlement, with the English church on the hill. The cape points northwest and the gulf lies to the right.

Grosse Isle. Partly overgrown sand dune; height about 150 feet

Plate 10

The beach at Grosse Isle; in the distance the long sand dunes stretching around North cape

I am informed by Doctors Lull and von Huene that recent study of this fossil shows it to be the lower jaw of the pelycosaur and hence indicative of Permian age.[1]

Volcanics. Mr Richardson believed that the volcanic deposits, on Amherst island particularly, lay at the base of the sedimentary series. It may be quite true that the evidence of their transection of the strata is obscure and even such obscure evidence may give way to proof of interbedding. These volcanics are diabases which stand out in nearly vertical posture on the sea cliffs, are highly amygdaloidal, deeply weathered, and complicated with gypsum deposits. In fact the compact beds are accompanied by agglomerations of lava blocks, decomposed tuffs and gypseous clays in very instructive association; wherever they lie in contact with the sandstones the latter are gray and hard, their induration and decoloration extending for considerable distances away from the contact. The apparent alteration of the augite or allied minerals in the diabase to a chloritic condition gives it in many places a vivid green color and its amygdules are found to contain analcite, chabazite, etc., while the crevices and seams carry pyrite, specular hematite and manganite. Sometimes the manganite is in considerable quantity and excavations have been made for it on Grindstone, whence nodules of comparatively large size have been taken. Frank D. Adams made analysis of this manganite in 1881[2] and found it to contain MnO_2, 45.61 per cent; water hygroscopic, 0.10 per cent. The hematite also occurs in considerable rather impure masses.

The association of the gypsum with the diabase is most intimate and while the character of the former is discussed separately I shall here refer to the mode of association. In the greater volcanic exposures, as on Grindstone above Cape aux Meules and on the east face of Alright, these vertical dikes make the highest cliffs. Here the accompanying agglomerates of volcanic blocks, the great masses of volcanic debris in the form of tuffs and ashes, have been referred to. On Grindstone the volcanic masses (at least two distinct dikes are present) have a thickness of fully a thousand feet; with them

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[1] Doctor Lull has given me the following citations relating to these remains:
Leidy. On Bathygnathus borealis, an extinct saurian of the New Red sandstone of Prince Edward's Island; Journ. Acad. Nat. Sci. Phila., (2), ii, p. 327–30, pl. XXXIII, 1854.
Cope. Synopsis of the extinct Batrachia, Reptilia, and Aves of North America, 1869, p. 119.
Dana. Manual of Geology, 4th ed., 1896, p. 754, fig. 1180.
Dawson, J. W. Acadian Geology, 1868, p. 119, fig. 29.
Case. Revision of the Pelycosauria of North America, 1907, p. 63.
von Huene. Neues Jahrb. f. Min., etc., Beil.-Bd. 20, 1895, p. 343.

[2] Chemical Contributions. Rept. Geol. Survey Canada, 1881, p. 18.

are heavy deposits of tough gypseous clays and fine clear cliffs of crystallized gypsum. All through the volcanics are seams and crystallizations of gypsum, permeating the mass through a multitude of crevices so that large blocks of trap lie entirely surrounded by gypsum. Wherever the trap extends the gypsum follows. In the course of this trap dike westward across Grindstone island the surface is broken up into kettle holes and knobs where the gypsum has undergone secondary change, and where it comes out at the western side of the island near Cape le Trou the white gypsum cliffs stand up brilliantly, with diabase on one side and fossiliferous magnesian limestone on the other. Wherever the volcanics are well developed the gypsum appears and seems always to occur in the presence of the volcanics, except on Grosse Isle Head where a small area of gypsum lies in the gray hard sandstones, and the volcanics, if present, are concealed under an overgrown surface. Without attempting to solve the problem of these interesting occurrences it may be said that there is very little lime left in the exposed rocks of the islands — too little by far to indicate an adequate supply for the lime in these masses of gypsum[1] and if the sulfur in the combination has been supplied by the lavas (which seems, in view of the intimate association of the masses, an almost unavoidable inference) it must have found its lime in some deeper source of older rocks.

Gypsum. The open display of this mineral is brilliant. In the sea faces of Grindstone and of Alright and the weathered pinnacles near Cape le Trou, the rock varies in color through white, gray and pink-white into saffron, red and black; most of it is mottled black and white in laminated colors and all is compact and solid. In secondary deposits among the cavities of the lava are sheets of satin spar together with great crystallizations from a foot's length to the size of one's arm. Some desultory efforts were made years ago to find a market for this gypsum but the material was carelessly selected and taken as ballast to Quebec; the attempt was not really a serious one. The natural supplies lie at the water's edge, working would be free and open and transportation by water to Montreal would give a short haulage by rail to manufacturing centers; by water to Pictou, Boston or New York would grade the haulage according to the port. I have had a series of analyses of the gypsum rock made by Dr E. W. Morley which give some clue as to the ability of the material to meet present commercial demands. These

[1] A million tons of gypsum are easily available on the island of Grindstone alone.

Plate 11

Etched boulder (dreikantner) of banded quartzite. Grosse Isle. Length 7 inches

Sand etched quartzite boulder from the dunes of Grosse Isle. Length six inches

Plate 13

Etched and glazed pebbles of quartzite and sandstone from the red sandstone beds on Grosse Isle head

samples were taken from the commonest expressions, not necessarily from the purest. Sample 1 is somewhat out of the ordinary and is not an average. Samples 2 and 3 are fair averages of the predominant rock and there remains a very substantial opportunity of acquiring a better grade by selection. These analyses are here appended.

ANALYSES OF GYPSUM FROM GRINDSTONE ISLAND

By E. W. Morley

Sample 1 Compact gray, with red and green mottles

2 Coarse crystalline, with alternating black and white bands

3 Darker, with more finely alternating black and white bands

(Each sample has been done in duplicate and the average given)

Sample 1	A	B	Average
Water	14.96	14.90	14.93
Silica	20.93	20.94	20.94
Alumina	5.14	5.07	5.10
Ferric oxid	2.20	2.21	2.21
Calcium carbonate	2.98	3.07	3.02
Magnesium carbonate	4.49	(4.49)	4.49
Calcium sulfate	49.50	49.25	49.37
Chlorine	Trace	Trace	Trace
	100.20	99.93	100.06

Sample 2	A	B	Average
Water	19.83	19.92	19.87
Silica	0.34	0.37	0.36
Alumina	0.00	0.01	0.01
Ferric oxid	0.36	0.38	0.37
Calcium carbonate	4.29	4.19	4.24
Magnesium carbonate	1.90	1.90	1.90
Calcium sulfate	73.34	73.44	73.39
	100.06	100.21	100.14

Sample 3	A	B	Average
Water	20.00	20.06	20.03
Silica	0.38	0.43	0.41
Alumina	0.29	0.27	0.28
Ferric oxid	0.32	0.32	0.32
Calcium carbonate	2.04	2.06	2.05
Magnesium carbonate	1.19	1.26	1.22
Calcium sulfate	75.74	75.82	75.78
	99.96	100.22	100.09

I have asked Mr David H. Newland, Assistant State Geologist and an accepted expert on gypsum and its commercial values, to express his judgment of the usefulness of these deposits so far as indicated by the analyses given. Mr Newland says:

The sample no. 1, described as "compact gray, with red and green mottles," is an impure material, containing only about 62 per cent of hydrated calcium sulfate or gypsum itself. There seems to be a good deal of free silica or quartz in the sample, and also clay, the latter reaching 10 per cent or a little more. The percentages of iron oxid and carbonates are likewise high as compared with the amounts found in most of the gypsum used for calcined plasters. Rock of the grade indicated by this analysis would have little or no commercial value. Owing to the high iron content the calcined product would undoubtedly be discolored, as it would also be inferior in setting properties by reason of its low percentage of calcium sulfate.

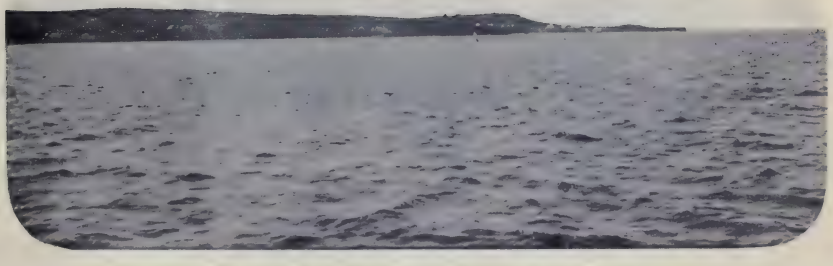
Sample no. 2, coarse crystalline, with alternating black and white bands, according to the analyses contains about 93 per cent of gypsum substance. The chief impurities are lime and magnesia carbonates. These act, of course, as dilutents but would not be detrimental to the use of the material for most purposes. The iron content is fairly low and the burned product should be a good white. The material compares well with the average rock used for the manufacture of calcined plaster in this country, though somewhat inferior to the highest grade of gypsum as represented, for example, in some of the western deposits.

Sample no. 3, darker than no. 2, with finer bands, has about 96 per cent of the hydrated sulfate. It differs from no. 2, chiefly in the smaller percentage of lime carbonate, the difference being made up by the increase in gypsum. The small percentage of alumina, indicative of the presence of clay, is negligible. While the iron is somewhat less in amount than in the preceding sample, there would probably be no essential variance of color between the calcined product of the two grades. The main feature is the increased percentage of the gypsum, which adds by so much to the commercial value of the rock.

Soil. The soil of the islands is essentially residual. The islands have never been subjected to glacial action. One finds on the sand spits and on the lower rock platforms, especially of the northern islands, plenty of ice-borne boulders, for the most part dropped where they lie, and now glazed by the blown sand, but there has been no disturbance of the soil by ice erosion. Hence the softer red rocks, which are largely felspathic, have undergone deep decomposition in place and, under the vegetable mould at the top, the soil extends downward often for 5 or 6 feet carrying all the structure of the

Plate 14

Northeast cape, northernmost land of the Magdalens, viewed from within the lagoon at Grosse Isle. This is the Cap au Dauphin of Cartier. 1534



West end of Brion island, seen from the north

stratification and passing by evidences of less and less decay into the disintegrating layers of the sandstone and thence into the solid rock. A typical section of the soil is given in this sketch, taken from the excavation for Miss Shea's hotel which was being dug at the time of my visit, on Mt Gridley, Amherst island. This includes a section 7′ 4″ from the surface, there being, from above down:

(1) 6″ of dark brown plant mold

(2) 8″ pure white sand

(3) 8″ deep black mold

(4) 3′ deep red residual soil retaining stratification lines and pebbles (rotted) in place

(5) 2′ 6″ reddish passing into yellow soil, running downward into the rotting rock fragments and finally to the solid rock.

White sand. In nearly every soil section on the red rocks the eye is struck by the persistent thin layer of pure white glistening sand not far beneath the surface. It occurs on all the islands, so far as I have visited them. This sand is doubtless the original red sand decolored by the organic acids which run downward from the vegetable mold, have dissolved the iron oxid and perhaps by transference have given the dark color to the layers which immediately underlie. These highly pure quartz sands are so interesting in their association and in their relation to this residual decomposition that I present here analyses of them made by Dr E. W. Morley, who precedes his report upon them by a statement of his mode of treatment. He says:

I first sifted the two samples, with as little friction as possible, through meshes of 20, 40, 60, 80 and 100 to the linear inch. The table inclosed shows the result. Then the two coarser educts from the white sand were gently pressed with the finger, and the sifting of this sample repeated, with the result shown. The coarser part of the red sand consisted of small fragments of sandstone but the fragments of the white sand were friable and fell into powder finer than 100 to the linear inch. This renders highly probable your suspicion as to the relation of the two sands.

On analyses, the composition was found as in the first and second columns of the table. It may be said that a trace of silica was not separated from the alumina, that potash and soda were not separated and that water was determined simply as loss. In other respects the analyses were as accurate as can be made.

In columns 3 and 4 the analyses have been recomputed as percentages of the weight found for silica. It is seen that every soluble constituent of the white sand is less than in the red sand. As the calcium oxid and sulfuric acid were in both cases equivalent within the errors of determination, they have been entered as calcium sulfate.

Sands from Magdalen islands

	ANALYSES		ANALYSES RECOMPUTED			Mesh of sieve	Red %	White %	Pressed white %
	Red	White	Red	White	Difference				
SiO_2....	82.15	91.66	100.00	100.00	.....	Retained by 20	4.3	5.0	0.7
Fe_2O_3...	1.30	0.42	1.58	0.46	1.12	40	3.9	2.2	0.2
Fe O....	0.28	0.25	0.33	0.27	0.06	60	3.1	8.2	7.2
Al_2O_3...	8.84	4.16	10.76	4.54	6.22	80	1.4	5.4	6.6
Ca O....	0.46	0.18	.....	.....	.....	100	3.5	9.2	8.9
Mg O...	0.49	0.14	0.60	0.15	0.45	Passed by 100	83.7	69.9	76.3
K_2 O....	3.17	2.25	3.86	2.45	1.41	.....	....	....	.....
SO_3.....	0.72	0.22	.....	.....	.....	.....	....	....	.....
Water...	2.51	0.65	.....	.....	.....	.....	....	....	.....
Ca So_4..	.....	.....	1.42	0.55	0.87	.....	....	....	.....
	99.92	99.93	118.55	108.42	10.13	.....	....	....	.....

In these analyses it is quite clear that the red sand differs from the white in the loss of nearly everything soluble by organic and meteoric acids and the inference is fair that the latter are the bleached residue of the former.

Depth of rock decomposition. So profound has been the decay of the red sandstones that it is sometimes difficult to tell where the altered rock ends and the unchanged rock begins. On nearly all sea front exposures, which have naturally not been of long duration, the finger can often penetrate the surface to a considerable depth. On Grosse Isle Head along a new road opened at the side of the lagoon, the red rock has been cut to a depth of several feet from the mold. The red rocks here are interspersed with boulders, some of which are sand-etched (dreikantner). These boulders, when crystaline, hold their substance well, but if of sandstone, as is often the case, they are rotted clear through like their matrix.

On Grindstone island, and particularly along the banks at Leslie cove, there lies between the deoxidized sand and the red sandstone an irregular layer of small angular diabase pebbles forming a gravel which lies with a conspicuous lack of uniformity and constitutes a component part of the sand rock. This layer may be traced all about the southwest cliffs of the island. The pebbles show no marked decay, and are in places accompanied by large boulders. While this layer of angular diabase pebbles lies directly beneath the soil, yet the parts which descend within the substance of the sand rock have no appearance of entering preexisting crevices but are a contemporaneous part of the sandstone itself.[1]

[1] On the cliffs of Red cape, Grindstone island, lying on this gravel layer and buried under 6 to 12 inches of plant mold and sod we uncovered the bones of

Plate 15

Great Bird rock, from the south; showing light house and accessory buildings

Little Bird rocks, seen from just off the Great Bird

Cliffs of Great Bird rock, from the north. The larger birds are gannets, the smaller murres and puffins.

Sea cliffs of Great Bird rock. Horizontal ledges of sandstone affording nesting places for the gannets and other sea fowl.

Deflation. In a region so given over to sands and so exposed to the winds evidences of the destructive power of moving sand are on every hand. The traveling of the dunes does not indeed extend far inland though they have piled up about the few spruce patches that remain on the shores. The most notable effect of sand etching is seen in the angled crystalline boulders. These boulders are ice borne, dropped where they lie by the bergs and floe ice of no recent date. It is very noticeable that these ice-carried blocks are much more abundant in the northern islands, Coffin and Grosse Isle, and that here nearly every example, whether on or in the soil, is a dreikantner, while on the southern islands such blocks are seldom angled by this etching. This fact is naturally explained by the much more exposed situation of the northern islands. Not only are these evidences of recent deflation very apparent, but the adjoining plate shows a group of sand-varnished, angular pebbles taken from several feet down in the decomposed red sandstone at Grosse Isle Head — a testimony that the moving sands were etching pebbles and boulders when these ancient sandstones were being formed, and rather conclusive proof of the continental origin of these rocks.

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several walruses, from the skull of one taking a great leaden slug weighing upward of an ounce. On the retreating sea cliffs these bones may be seen projecting here and there from beneath the uncertain soil. These are rather interesting occurrences as it is said that no walrus has been killed in the Magdalens since late in the 18th century. The hunting of the walrus is one of the romantic bits of the early history of the islands. Cartier's enthusiastic account of Brion island and its paradisiacal charms told stories of them which excited the lust of both Bretons and English and it was over the walrus hunting that blood was shed between these peoples. In this pursuit it was the practice to drive the great beasts from the waters or the floe ice up on to the low shore platforms and shoot them at leisure. The bones of the victims are occasionally found at Old Harry point and elsewhere, while the name Sea Cow (vache marine) point still records these resorts. Dr J. A. Allen quotes Professor Packard as stating that the last walrus seen in the gulf was in 1841, when one was killed at St Augustine on the Labrador, but I have heard the report that a few years ago one floated on an ice cake driven under a northeast gale, well up the St Lawrence to beyond Fox river.

The Rev. John Prout, Anglican minister in the islands, kindly put me in the way of securing a very large head taken from the drifted sands at Wolf island and I append here some comparative notes as to its dimensions:

Dr Allen in his measurements of skulls of the Atlantic walrus, Odobaenus rosmarus, cites from one old male: (1) Canines, length from plane of molars, 330 mm; (2) canines, circumference at base, 197 mm; (3) canines, distance apart at tips, 273 mm. A middle aged male gave the following: (1) 250, (2) 177, (3) 248.

The skull taken from the sands of Wolf island has these measurements thus: (1) 410 mm, (2) 190 mm, (3) 280 mm.

Fertility. The deep rich residual soil that overlies the plateaus of the lower land levels has an unbounded fertility and on the knobs and demoiselles where the red sandstone runs into the gray its fertility is carried with it. Today a mere scratching of the surface of the land produces an abundant return of grass, barley and oats and deep plowing is seldom done. Indeed, year after year gives the same fair return of hay without any cultivation. With the simplest mode of planting, potatoes produce enormously and are the common winter food for hogs and cattle. The natural situation of the islands has made them the home of fisherfolk. The lobster, cod, mackerel, herring and seal abound here as they do nowhere else in the gulf and it is these that absorb the energies of the people. Farming only tides over the intervals between the fishing to maintain the live stock and to afford a supply of vegetables. The fertility of the soil seems to have been entirely overlooked as a commercial factor but even recognizing the limitations of the season, it has tremendous possibilities and in the matter of potato cultivation would give large returns at a minimum of cost.

RECENT LITERATURE RELATING TO THE MAGDALEN ISLANDS

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S. G. W. Benjamin. The Cruise of the "Alice May." The Century Magazine, April 1884.

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W. Lacey Amy. The Magdalen Islands. Canadian Magazine. February and March 1911.

For Cartier's route along these islands, 1534, 1535, *see* J. P. Baxter: Jacques Cartier. 1906.

THE CARBONIC FAUNA OF THE MAGDALEN ISLANDS

By J. W. Beede

The Carbonic (Mississippic) fauna of the Magdalen islands, collected by Doctor Clarke, was submitted to the writer for study. Like the earlier Paleozoic faunas of the Gulf of St Lawrence region, these Carbonic faunas are peculiarly interesting and exhibit characters which throw much light on the history and geography of the time and region in which they lived.

In preparing these notes the writer has been under obligation to the authorities of the Peter Redpath Museum, McGill University, for the loan of material from the Dawson collection for comparison with the fauna in hand, and to Dr Stuart Weller for similar aid from the Walker Museum.

History and correlation of the fauna

The only mention heretofore made of this Magdalen islands fauna is in Richardson's report of 1881, to the Canadian Survey. The very few fossils then collected were submitted to Sir William Dawson for identification and his letter in reply is quoted as follows: "I should think the fossils herewith returned indicate, so far as they go, a lower Carboniferous age. The most characteristic is a small specimen of Bakewellia antiqua, a very widely distributed species, of which I send one of my own specimens from Windsor for comparison. There is also a Modiola or Cypricardia, which may be the shell I have called avonia, from Windsor, in Nova Scotia; and a little Cardinia like C. mara, but not determinable. The most abundant species is a Serpulites which is very near S. annulites, from Nova Scotia, but the state of preservation is so peculiar that I can not be sure of it; the rock altogether resembles one of those black eroded limestones, which, in Nova Scotia, we find in close proximity to the beds of gypsum and which are usually very bare in fossils."

Sir William here drew no conclusion regarding correlation, but it is fair to infer that he supposed the fossils from the Magdalens and Nova Scotia to be intimately related. An inspection of the list of species recorded later in this discussion shows that the relation of these faunas is quite as intimate as Dawson suspected. Indeed it

is so close that the outside correlation of the one may be regarded as equally affecting the other.

Correlation of the Nova Scotia faunas

In the light of these facts the history of the correlation of the Nova Scotia faunas is of peculiar interest here.

Dawson considered their position in the geologic column and their relationships abroad very thoroughly and discussed these points in some detail in his *Acadian Geology*,[1] from which the following summary is extracted:

"The earliest statement as to their age was that of Mr R. Brown, in Hamilton's 'Nova Scotia.' He correctly regarded the limestones of northern Cumberland as lower Carboniferous, on the evidence of their stratigraphical position as underlying the Cumberland coal-field."

In the central part of the province these rocks were referred to the "New Red Sandstone." In 1841 Sir William Logan took the beds below the Windsor limestones at Windsor, Nova Scotia, to be Coal Measures and referred the limestones to the Permic. In 1843 Lyell explored the Avon-Pictou region and doubted Logan's correlation. His views were subsequently confirmed by Dawson and Brown. Davidson found many of the brachiopods to be identical with those of the British "Carboniferous Limestone." De Koninck confirmed Davidson's view and correlated them directly with the Carbonic limestones of Visé, Belgium. Nevertheless the red sandstones, marls and pelecypod fauna recalled to their minds the rocks and fauna of the Permic system, the "Bakewellias" playing an important rôle in this respect, and it was also pointed out that they did not suggest the Carbonic of the United States, but the Permo-carbonic, Newberry and Meek both remarking upon it.

In the last edition of *Acadian Geology*, Dawson clearly summarizes his views on the age of the rocks and the peculiarities of the fauna. In number 6 of these statements (p. 284) he says: "It is evident that the marine fauna of the Lower Carboniferous in Nova Scotia more nearly resembles that of Europe than that of the western states. This is no doubt connected with the fact that the Atlantic was probably an unobstructed sea basin as now, while the Appalachians already, in part, separated the deep sea faunas of the Carboniferous seas east and west of them . . . " and again:

"It is a matter of regret to me that I have not had the time fully

[1] Dawson, Acadian Geology, p. 278–85. 1878.

to investigate all the facts belonging to this curious question. I would commend it to those who follow me, to whom that which I have been able to do may at least be of use in guiding their researches."

Here we have a clear conception of the scope of the whole problem.

Passing over the intervening time to the present, Schuchert's summary of the correlation will suffice for our purposes. He states:

"The oldest fauna of this series at Windsor includes but few species, and these remind one of Kinderhookian time. In the higher dolomites at Windsor a rich fauna appears that is very different from that in any American Mississippic horizon, and as it is also unlike those of Europe it is difficult to correlate. Seemingly it is of Keokuk time, yet it may be somewhat younger, as Lithostrotion is reported at Pictou, which is not far from Windsor." [1]

Characteristics of the fauna

The faunas here discussed were collected from two islands, Grindstone and Coffin, and from five localities, as follows: On Grindstone island: (1) close against the gypsum bluffs not far from Cape le Trou on the west coast, where the rock is a very calcareous, rusty sandstone; (2) near the gypsum bluffs facing the great lagoon, on the property of N. Arseneau — gray calcareous shale as in the locality following. On Coffin island at Oyster basin in a calcareous shale; fragments of this shale have been obtained at Grand Entry landing and at Old Harry point, both on Coffin island, but the former were transported and the latter probably not in place.

In the Grindstone island fauna the most striking feature is the peculiarity of its makeup. The brachiopods are characterized by an abundance of Productus belonging to two limited groups, all other groups being absent. There is also a total absence of the Spirifers. A few Dielasmas are present, a Pugnax and an Orbiculoidea. The Pelecypoda are well represented. Among them are Liopteria, Parallelidon, Modiola and Aviculopecten which constitute the majority of the specimens. There are a few undeterminable gastropods, a Euomphalus and a few poorly preserved cephalopods.

The Productus fauna seems to have developed from two stocks, in an inclosed basin, and the species present fall into two groups, the members of each group being in many ways strikingly similar, but differing sufficiently to permit of careful distinction. This char-

[1] Schuchert. Paleogeography of North America. Geol. Soc. Amer. Bul. p. 551. 1910.

acter, together with the fact that the other groups common to the rocks of this age are absent, is indicative of the isolation of the basin at the time the rocks were deposited. The absence of the Spirifers and of Chonetes, Derbya, Orthothetes and the like all point to the same conclusion.

A general feature of the fauna, especially of the Grindstone island localities, is the extent to which it is dwarfed, the dwarfing being carried even farther than is the case with the Nova Scotian fossils.

Both the Grindstone and Coffin island faunas are related to the "carboniferous limestones" of Nova Scotia, the former the more intimately. The Oyster basin material has 8 species in common with the Nova Scotia rocks and the Cape le Trou material has 20 species. The Cape le Trou and Oyster basin rocks have 6 species in common as listed in this paper. Four species are common to both islands and to the Nova Scotia rocks.

Serpulu infinitesima, Stenopora? sp., Hemiptychina? waageni, Lingula, Strophalosia, Aviculopinna, Nucula, Pleurophorus?, Schizodus denysi, Martinia glabra, Bucanopsis, Euphemus?, and the Ostracoda are confined to the Oyster basin locality and horizon. Five of these species are rather common, several specimens of each and more of some of them occurring in the collection.

The following rather important species, or genera, are represented only in the Cape le Trou collection, the most of them by a number of specimens: Spirorbis sp., Rhombopora exilis?, Dielasma sacculus, Productus auriculispinus, Pugnax, Aviculopecten lyelli, Liopteria, Modiola pooli, Parallelidon dawsoni, Euomphalus exortivus?, and most of the cephalopods. The striking feature of these comparisons is the fact that so many of the common species at each locality are restricted to that locality and bed. Though the beds are distinct and of somewhat different composition, yet they are hardly so different as to account for the difference in the faunas contained. There would seem to be a stratigraphic break or a considerable difference in the salinity of the water in which the two beds were laid down. The two localities are about 35 miles apart.

The species in common are: Beecheria davidsoni?, Orbiculoidea limata, Productus dawsoni, its variety acadicus, P. tenuicostiformis, and Orthoceras sp. A.

The peculiarities of the Oyster basin fauna, besides those already discussed, are relatively few, it being a better balanced one than that of Cape le Trou. As to which of these two is the older will probably have to be left to the stratigraphy. In the Windsor (Nova Scotia) section most of the Spiriferacea were confined to the base of the section or were more abundant there than anywhere else. We do not know the range of the species in that section. The fact that Martinia glabra occurs here and not at Cape le Trou could be interpreted as evidence for the greater age of the Oyster basin beds. The restricted Productus fauna of the latter beds and the absence of Aviculopecten lyelli would also point in the same direction. There can be little doubt that the Cape le Trou beds represent beds *d* or *e*, or both, in the Windsor section. From the description given by Dawson[1] it also seems probable that the Oyster basin rocks may represent the base, beds *a*, and *b*, of the Windsor section. The Nodosinella, worms etc., together with Martinia glabra, would seem to indicate it, but by no means certainly.

The Nodosinella from a pebble on the beach of Coffin island at Grand Entry is of peculiar interest in being closely allied to a British species. The Nuculas show a fairly close relationship to British species.

The Oyster basin fossils indicate quite as close alliance with the remaining American Mississippic faunas as does the Cape le Trou fauna. One species, Schizodus cuneus Hall, is almost certainly specifically identical. Girty records Martinia glabra? from the Moorefield shales of Arkansas, and two or three other shells are likely to prove identical on further evidence. None of the Magdalen islands species has been considered identical with the other American species unless the evidence was practically conclusive. This method is hardly practical in studying faunas of the same general basin and succession, but in treating isolated basins it is the only safe one. Aside from the evidence referred to, the affinities of the Oyster basin fauna seem to lie quite as strongly with the Kinderhook as do the affinities of Cape le Trou fossils.

I can not hope to have avoided all British and western European synonomy in describing these fossils, since neither the great mass of the literature nor the time to utilize it has been at my disposal.

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[1] Acadian Geology, p. 279, 280. 1878.

Correlation with Mississippi basin faunas

A very striking evidence of the isolation of the southern St Lawrence basin at this time is the want of relationship of the fauna of Nova Scotia and the Magdalen islands, with the faunas of similar age in the Mississippi basin. While the number of species common to the two regions is small, yet careful study reveals several species of very similar characters. This is especially true of species of the genera Edmondia, Liopteria, Productus, Schizodus etc. Indeed some of them are so similar that were one a little incautious in discriminating characters they might be considered as identical.

Productus tenuicostiformis is sufficiently like P. tenuicosta that were it larger and more produced anteriorly the two would readily pass as the same species. P. dawsoni is also closely related to P. laevicosta and P. ovata. Edmondia sp. is very closely related to E. nitida and to E. quadrata from the Kinderhook, but appears to have the beaks more nearly terminal, and is closely related to E. obliqua from the Devonic. Relationships nearly as close occur among the other groups and will be occasionally mentioned under the specific descriptions. The general affinities seem to lie with the lower Mississippic. At the same time their rather close relationship to the Devonic pelecypods also makes it apparent that the fauna can not be much farther removed from the Devonic than its relationships with the Mississippi valley faunas would indicate. There seems to be much evidence in the Magdalen islands material to confirm Schuchert's correlation of the beds with the Kinderhook and immediately overlying beds.

THE FAUNA OF CAPE LE TROU, GRINDSTONE ISLAND

These specimens are mostly preserved as casts in a ferruginous magnesian limestone having the appearance of a brownish sandstone.

Spirorbis sp.

Casts too poorly preserved for identification.

Rhombopora exilis Dawson?

Stenopora exilis Dawson. Acad. Geol. p. 287, fig. 85. 1878.

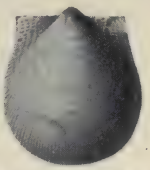
Molds of specimens have the size and form of this species and so far as can be determined, a similar topography.

Orbiculoidea limata nov. ?

(See page 177)

Productus dawsoni nov.

Specimen nearly subquadrate in outline, widest somewhat in front of the middle. The hinge is slightly shorter than the greatest width of the shell, the lateral margins are concave posteriorly and very gently rounded into the evenly curved anterior margin. The shell is quite depressed for a Productus and the beak barely projects beyond the hinge, not recurving around it. The ears are nearly flat, triangular, carrying many fine spines. The remaining characters are common to the rest of the surface. The surface of the pedicle valve is ornamented with very fine striae which are sharply rounded and narrower than the valleys separating them, somewhat inclined to be wavy, increasing by implantation. The spines of this form seem to be confined to the ears, or nearly so. Posteriorly, there are very slight concentric wrinkles.



Productus dawsoni nov. Pedicle valve, Cape le Trou, Grindstone I.

Dimensions. Length and width of shell 20 mm, length of hinge 15 mm. The specimen figured has a convexity of 4 mm, though it may be very slightly flattened. Fifteen or more striae in 5 mm.

Remarks. This species is very similar to specimens labeled Productus cora var. dawsoni Hartt, from the Carbonic limestone of Nova Scotia. It is also very closely related to the form figured by De Koninck from the limestone of Visé, Belgium, under the term P. striatus.

Productus dawsoni var. acadicus nov. Cape le Trou, Grindstone I.

Productus dawsoni acadicus nov.

This variety resembles P. dawsoni in many of its characters but is much more convex, relatively broader and perhaps has a somewhat more protruding beak.

Dimensions. Length, 19.5 mm; width, 21.5 mm; length of hinge, 17.5 mm; convexity, 7 mm, and slightly flattened.

Productus arseneaui nov.

Cast of small size, subquadrate, wider than long. Ears small, convex, with concentric wrinkles. Hinge-length and transverse diameter of the shell about equal. Lateral margins arcuate; anterior border broadly sinuate, the sinus occupying half its length. The sinus is present over half the length of the pedicle valve. On the surface are about 66 radiating striae, 11 or 12 in 5 mm. They increase in number by implantation and bifurcation, spines sometimes

occurring on the latter points. Posterior part of shell with transverse wrinkles. Diductor muscles attached to 5 or 6 diverging ridges in the pedicle valve; adductor callosities elliptical, deeply depressed on cast.

Remarks. The sinus and the diductor scars and general form of the shell distinguish it from the other species.

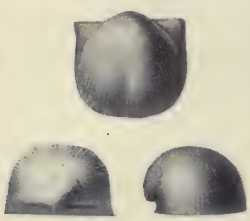
Productus laevicostus White?

Productus laevicostus White. Journ. Boston Soc. Nat. Hist. 7:220. 1860.

A specimen apparently identical with this species.

Productus prouti nov.

Shell small, very arcuate from beak to front, except in old specimens when the anterior is nearly straight. Hinge-length slightly exceeding the width of the shell which is narrow for its height. Surface poorly preserved, but one specimen is marked with 9 or 10 striae to 5 mm. On some of the specimens there is no sinus.



Productus prouti nov.
Cape le Trou, Grindstone I.

Dimensions. Length of shell 12 mm; width, 14 mm; length of hinge about 16 mm; convexity, 10 mm.

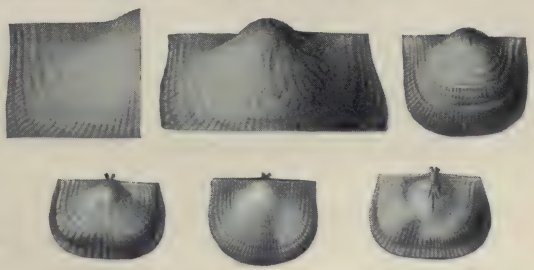
Remarks. This species differs from P. doubleti in being much more arcuate, more finely striated, and in having a much more highly inflated beak.

As is shown in the illustration, the shell appears to have had a considerable cardinal area and may possibly have possessed teeth. Better preserved material may show it to be a Productella.

Productus tenuicostiformis nov.

Shell subquadrate, gibbous; hinge as long or longer than the transverse diameter of the shell; lateral margins nearly straight from the hinge nearly to the front of the shell where they gently curve into the nearly straight anterior border; beak but slightly produced beyond the hinge, not recurved, very slightly and very broadly inflated. Pedicle valve very strongly arcuate longitudinally and a terrace is frequently traceable around the shell at the edge of the visceral chamber; surface sculptured with moderately fine radiating striae about equal in width to the intervening depression, increasing

largely by interpolation in the older part of the shell and by splitting in the anterior portion. Ten or 12 spines are scattered over the surface of the shell and several crowded on the ears. Posterior part of the valve marked with concentric wrinkles becoming stronger near the ears. The interior of the valve has the muscular attachments well developed and sharply defined as is revealed in a cast; anterior adductors attached to low indistinct ridges; diductors attached to four or five low bilobate or looped ridges on either side of the adductors. Brachial valve more nearly subquadrate than the pedicle valve, the hinge being about equal to the anterior width of the shell. Valve nearly flat over the visceral region, somewhat depressed in the central region and elevated around it, geniculated at the margin (unless surrounded by a wall). Beginning at the ears a very narrow platform extends outward enlarging as it passes around the sides to the anterior of the valve where it has the width of a millimeter or more. Mesial septum reaching well toward anterior part of valve. Adductor attachments nearly round but showing a tendency to digitate lobation. Cardinal process bilobate at least below, as shown in cast.



Productus tenuicostiformis nov. Cape le Trou, Grindstone I.

Dimensions. Length of shell, 14 mm; width, 18 mm; length of hinge, 19 mm; 9 or 10 striae in 5 mm.

Remarks. The horizontal platform surrounding the visceral area of the brachial valve is of unusual interest since it occupies the position of the murication in Marginifera. No murication is, however, preserved in our specimens, though it could hardly be expected that it would be, and there is little to lead one to suspect that such murication did exist. The generic disposition of the shell is not quite clear. The cardinal process is bilobate, below at least, as in Productella, though there seem to be no crural plates to assist in forming sockets for the teeth of the opposite valve and the pedicle valve seems not to have had teeth. The well-defined muscular attachments go with other characters in suggesting its place in Productus. The platform, even though not supporting a murication, seems to forecast the subgenus Marginifera. Since the more important features are those of Productus, it seems advisable to

leave it in that genus until better material is available. This material will be found upon careful search in the Carbonic limestone of Nova Scotia.

Externally, this species resembles Productus tenuicosta from the type locality, though it is much smaller and much less produced anteriorly. The full elucidation of the internal characters of both species may show them to be identical, but at present this seems unlikely.

Since this discussion was written a copy of Girty's paper,[1] in which he describes the new subgenus Diaphragmus, has come to notice. The character upon which this subgenus is based is exhibited in specimens from the Chesser Group and in a fragmentary specimen figured later from the Moorefield shales. The specimens from older rocks at Cape le Trou and Oyster basin have this feature well developed. Indeed there is some suspicion of its presence in what may be Strophalosias from the latter locality. This character seems to have originated as early as the lowest Kinderhook or later Devonic in such shells as Productus dissimilis Hall, and reached its fullest development in Marginifera muricata, M. splendens, and M. wabashensis. The presence of the "plate" or "diaphragm" is to be regarded as the inception of shell deposition in the peripheral region of the brachial valve together with its geniculation and later became more and more pronounced resulting in sharp murication of the Pennsylvanic species. Since somewhat similar characters occur in other shells of the Strophomenacea the structure is of doubtful systematic significance at best, and the splitting up of the subgenus Marginifera on the basis of the extent of the deposit seems hardly warranted.

Productus doubleti nov.

Cast small, gibbous, strongly arcuate longitudinally, most arcuate near the beak. Beak inflated, broad and full, extending but slightly beyond the hinge. No marked sinus present, central part of shell but slightly flattened in transverse profile; nearly equally arcuate when viewed from side or front. Hinge about equal in length to the greatest anterior width of the shell. Lateral margins slightly arcuate, rounding into the convex front of the shell. On the surface there are 36 coarse radiating striae, those in the central part of the shell being coarser than those on the sides. No

Productus doubleti nov. Anterior and posterior views of cast of pedicle valve. Cape le Trou, Grindstone I.

[1] Ann. N. Y. Acad. Sci., XX, 3, II, p. 217, 1910.

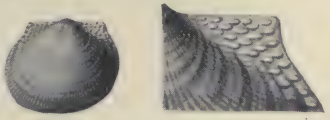
concentric wrinkles over visceral region except a trace of one near the left ear. Muscular impressions weak and not so elaborate as in the preceding species.

Dimensions. Length, 12 mm; width, 16 mm; hinge, probably 13 or 14 mm; 6 striae in 5 mm.

Remarks. This shell resembles to some extent P. arcuata Hall but is smaller, almost without reticulations over the visceral chamber and very much less produced anteriorly.

Productus auriculispinus nov.

Shell small, subquadrate in outline, somewhat broader than long. Beak but moderately inflated, the shell rather evenly convex. Hinge short, postlateral margins gently sinuate reaching the hinge nearly at right angles; lateral margins rounding into the evenly convex anterior border. Beak projecting but slightly beyond the hinge and not recurving around it. Fine spines are crowded in rows on the small, triangular, flat ears. Shell covered with fine radiating striae about equal in width to the furrows between them, increasing in number by interpolation or rarely by bifurcation. Crossing these are ill-defined concentric wrinkles, which are much better defined and stronger on the brachial valve.



Productus auriculispinus nov. Cape le Trou, Grindstone I.

Dimensions. Length, 13 mm; width, 15 mm; length of hinge, 10 mm; 12 or 13 striae in 5 mm.

Remarks. This species differs from P. dawsoni in being relatively broader with shorter hinge and in greater general convexity of the pedicle valve. Specimens nearly related to or perhaps identical with this one were included by Dawson under Productus cora. They occur in the limestones at Windsor, Nova Scotia. There is little danger of confusing this species with any other American member of the genus.

Pugnax magdalena nov. Dorsal and ventral sides. Cape le Trou, Grindstone I.

Pugnax magdalena nov.

Specimens of moderate size, flattened upon fossilization, apparently rather gibbous and orbicular in outline in uncompressed specimens. Posterior third of shell smooth, anterior two-thirds with fold, sinus and costae; fold decidedly elevated and divided by a median sulcus into two strong, angular costae. There are two or three

costae on the sides of the brachial valve. Pedicle valve gently convex posteriorly, deeply and broadly sinuate in front with single broad, low fold in the center and two or three on the sides of the valve. The cast, though excellently preserved, shows no indication of a mesial septum in the brachial valve.

Dimensions. Length, 8.5 mm; width, 9.5 mm; somewhat modified by flattening.

Remarks. Externally this species seems closely related to Camarophoria explanata McChesney, and to P. globulina Phillips. It is very doubtful if the shell was ever so globular as the latter, on the form figured by Dawson, and the former has been shown by Weller to be a true Camarophoria, possessing a strong mesial septum. Our specimen apparently is without this septum and consequently a true Pugnax, like those of the Mountain limestone of Ireland.

Dielasma sacculus Martin

Dielasma sacculus (Martin). Cast of ventral valve. Cape le Trou, Grindstone I.

Beecheria davidsoni Hall & Clarke

A poor cast having a form very suggestive of this species.

Edmondia intermedia nov.

Cast small, obliquely subovate or quadrilateral, only moderately gibbous, beak very near the front of the shell; hinge straight with characteristic slit beneath it; posterior margin nearly straight and oblique above, rounding into the elliptical ventral border which passes with a still gentler curve upward to the hinge. Surface of cast striated on its younger portion with minute, evenly spaced lines parallel with the border; there are also larger growth varices.

Edmondia intermedia nov. Cast of left valve. Cape le Trou, Grindstone I.

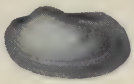
Dimensions. Length, 17 mm; height, 15 mm; length of hinge, about 10 mm.

Remarks. It is not certain that this species may not be E. nitida Winchell, and it is also very closely related to E. quadrata Weller. It differs from them, apparently, in having its beak more nearly terminal. It is also closely related to E. obliqua Hall,

but differs from it in the same respect as well as in the less angular termination of the umbonal ridge and in having the ventral and dorsal margins more nearly parallel.

Edmondia magdalena nov.

Shell small, oblique, very elongate for the genus, nearly twice as long as high. Umbones inflated, protruding above the hinge which is nearly straight and extending about six-tenths the length of the shell. Posterior margin subtruncate, rounding below into the elliptical ventral border which continues in an elliptical curve to the hinge. Beak 2 mm from the anterior end of the hinge. The details of ornamentation are not well shown on the cast, but there are fine, even concentric striae and the usual undulations of the genus.



Edmondia magdalena nov. x2 Cast of left valve. Cape le Trou Grindstone I.

Dimensions. Length, 9+mm; height, 5+mm; hinge, 6+mm.

Remarks. This species is similar to E. hartti Dawson, but is much smaller and the hinge slopes less steeply anteriorly, and it is slightly more truncated on the posterior end.

Parallelidon hardingi Dawson?

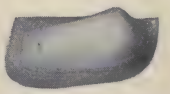
Macrodon hardingi Dawson. Acadian Geology, p. 302, fig. 102, 1878.

One small specimen probably belongs to this species. It is on a slab with Sanguinolites insecta Daw.

Parallelidon hardingi Dawson. Windsor, N. S.

Parallelidon dawsoni nov.

Shell small, subquadrangular, beaks very convex and arched over the cardinal area. Anterior end short, abruptly rounding downward and backward into the gently sinuate ventral margin. Posterior lateral edge evenly and abruptly rounded into the truncated posterior margin which reaches the hinge at a slightly obtuse angle, the anterior and posterior borders being nearly parallel. The length of the hinge is equal to the length of the shell and its direction nearly parallel to the ventral margin. The cast shows fine concentric lines and larger growth varices.



Parallelidon dawsoni nov. Cape le Trou, Grindstone I.

Dimensions. Length, 13.5 mm; height, 7 mm; beak, 4.5 mm from front.

Remarks. In illustrating his species, P. hardingi, Dawson used two specimens, one (fig. 102a) a very short, highly gibbous specimen, quite convex beneath the beaks and on the ventral margin

also; and a much longer specimen (fig. 102b) which was less gibbous, with fairly strong depression beneath the beaks producing a corresponding sinuosity in the ventral border. In this genus it seems that these specimens must be regarded as being specifically distinct. The first is taken as the type of his species and the second (2820, in part, Peter Redpath Museum) is regarded as belonging to the species now under discussion. The casts from Grindstone island are smaller and show no trace of radiate markings, nor does the specimen (a cast) just referred to in the Dawson collection. They are regarded as belonging to the same species.

This species is very closely related to P. obsoletus Meek and Worthen, from the Coal Measures of the Mississippi valley, but is smaller, has the beak extending more sharply over the cardinal area, and the long teeth parallel to the hinge reach much farther back. It differs from P. cochlearis (Winchell) as figured by Weller in that the posterior margin joins the hinge much more nearly at right angles, making the shell less oblique. That shell is probably the nearest relative known of our species.

Leptodesma borealis nov.

Cast of right valve small, aviculiform, with long projection in front of the beak. Hinge about as long as the shell; posterior margin sinuate above but soon becoming gently convex and gradually rounding into the ventral margin. Ventral margin quite sinuate beneath the beak on account of the strong depression in the shell, beyond which the border is convex to the tip of the hinge. The umbonal ridge nearly dies out posteriorly. Surface marked with varices of growth and smaller striae.

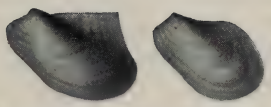
Leptodesma borealis nov. x2. Cast of right valve. Cape le Trou, Grindstone I.

Dimensions. Length of hinge, 8 mm; length of umbonal ridge, 6 mm; beak, 2+mm from front of hinge; height of shell at posterior end of hinge, 4.75 mm; angle of umbonal ridge to hinge about 30°.

Liopteria dawsoni nov.

Cast of left valve small, moderately convex, hinge shorter than the length of the umbonal ridge. Posterior margin sinuate, rather evenly rounded at the termination of the umbonal ridge; ventral margin somewhat sinuate anteriorly but convex around the lobe projecting in front of the beak. The lobe is small and nearly tri-

angular. The weak teeth parallel to the posterior end of the hinge are shown. Varices of growth more widely spaced along the umbonal ridge than elsewhere; the finer lines being about evenly spaced except near the beak.



Liopteria dawsoni nov. x 2. Cape le Trou, Grindstone I.

Dimensions. Length of hinge (from back to posterior end, in this case), 7.5 mm; length of umbonal ridge, 8+mm; height at extremity of hinge, 6+mm; angle of umbonal ridge to hinge, 35°.

Bakewellia antiqua" Dawson. Gay's river, N. S.

Remarks. Though smaller, these specimens seem to be the same species as the "Bakewellia antiqua" of the Dawson collection from Gay's river, N. S. Neither our specimens nor the one examined from the Peter Redpath Museum, Dawson's collection, were seen to possess the vertical cartilage pits of Bakewellia though they may possess them. Until they are discovered I am inclined to refer the specimens to the genus Liopteria.

Liopteria acadica nov.

Cast of left valve small, aviculiform, well inflated for this genus, hinge shorter than the shell. Beak well elevated; umbonal ridge elevated and very oblique; posterior margin obliquely sinuate, rounding regularly and rapidly into the convex posterior ventral margin; ventral border sinuate beneath the beak; anterior end of shell lobate, the front sloping downward. Cast shows the usual varices and finer striae of growth common to these shells from this locality.

Liopteria acadica nov. x 1.5. Cape le Trou, Grindstone I.

Dimensions. Length of hinge, 7 mm; length of umbonal ridge, 11 mm; greatest length of shell, 12 mm; angle of umbonal ridge to hinge, 25°.

Pteronites cf. **latus** McCoy

Pteronites latus McCoy. Carb. Foss. Ireland, p. 81, pl. 13, fig. 7, 1844.

Pteronites latus Hind. Carb. Lam. p. 8, pl. 5, fig. 6, 7, 1901.

Shell small, subtriangular, posterior end probably slightly sinuous. Growth undulations are the only surface marks preserved on the cast. Beak removed from anterior margin. The angle between the hinge and ventral margin is about 35°, the length of the hinge, 11

mm; the height at extremity of hinge, about 7 mm; greatest length of the shell, 12 mm.

Remarks. The ends of our specimen are missing. The shell is very similar in form to Hind's figure of P. latus McCoy, and the dimensions are similar, relatively, though our specimen is much smaller. It also seems to be related to shells from the Waverly of Ohio.

Cardinia subquadrata Dawson?

Cardinia subquadrata Dawson. Acadian Geology, p. 304, fig. 108, 1878.

A poor cast, the generic and specific determinations doubtful.

Schizodus richardsoni nov.

Cast of valve small, form oblique, characteristic of genus. Beak subtriangular, narrowly inflated; umbonal ridge elevated and gently angular; anterior end of shell short, rapidly curving downward into the elliptical ventral margin which terminates in the angular upward turn at the end of the umbonal ridge. Posterior truncated margin nearly straight and almost vertical, reaching the hinge at an angle of about 120° leaving a relatively large concave triangular area above the umbonal ridge and below the hinge.

Schizodus richardsoni nov. Cast of left valve. Cape le Trou, Grindstone I.

Dimensions. Height, 9 mm; length, 11 mm; length umbonal ridge, 10 mm.

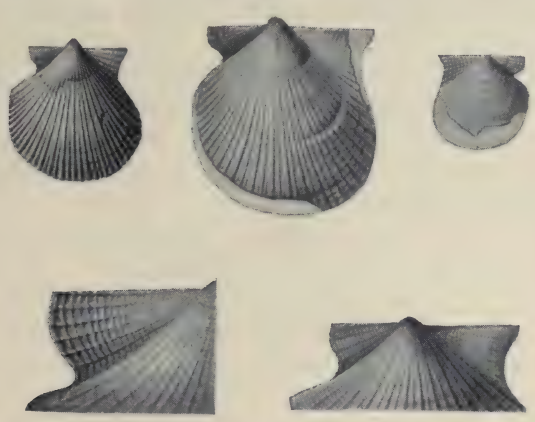
Remarks. This species is much like S. ellipticus Hall, from the Hamilton. It seems to differ from it in the front of the shell being shorter and the posterior margin reaching the hinge at a larger angle. The beak is thus made a little more prominent. It differs from S. iowensis in having a relatively longer, straighter hinge while the area between the hinge and the umbonal ridge is proportionately larger and the posterior truncation more nearly vertical. Our specimens are closely related to both species.

Aviculopecten lyelli Dawson

Aviculopecten lyelli Dawson. Acadian Geology, p. 305, fig. 111a-c, 1878.

Cast of left valve subovate, beak pointed, protruding 1.5 mm beyond the hinge. Shell moderately convex; anterior ear triangular, separated from the shell by a sulcus, rounded at the extremity; margin separated from that of the shell by a deep sharp sinus. Posterior ear somewhat larger, triangular, less sharply separated

from the body of the shell, extremity rather pointed, posterior margin sinuate in joining the shell. Both ears ornamented by radiating striae crossed by striae which, on the anterior ear, are sharp and high, giving it a cancellated appearance. The sculpturing of the shell is somewhat similar to that of the ear. The radiating costae two ranked, the smaller ones interpolated between the larger, 37 in all, crossed by concentric lamellae which are highly vaulted on crossing the ridges as shown in the molds. Ridges rather sharp and about as broad as the furrows except on posterior region where the latter are wider.



Aviculopecten lyelli Dawson. Above, two left valves and one right; below, enlargements of the hinge. Cape le Trou, Grindstone I.

Dimensions. Length of hinge, 12.75 mm; length of shell, 17 mm: height, 19 mm; 6 or 7 striae in 5 mm; angle of beak about 90°.

Remarks. The specimens figured and described here are somewhat undersized. They are closely related to a species from the Knobstone of Indiana but differ in the relative breadth of the ribs, size of the shell, etc. There is a cavity beneath the beaks of our casts, but it is difficult to determine its true character.

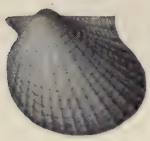
Aviculopecten acadicus Hartt?

Cf. Aviculopecten acadicus Hartt. Dawson's Acadian Geology, p. 307, fig. 114, 1878.

Shell small, convex; ears not well developed; beak sharply pointed. Anterior ear sharply separated from the shell, posterior ear not so distinct from it. About 25 radiating costae are shown, separated by wide interspaces and crossed by concentric lines or laminae which are raised on the costae making them appear nodose or the shell reticulated.

Dimensions. Length, 4 mm; height, 4 mm.

Remarks. The slight truncation prevents the shell from being circular as described by Hartt for his specimen from the base of the Windsor limestone. In other respects it agrees very closely with his description and the bit of surface detail figured by him, unless the lamellae are more highly vaulted on our specimen. The species is unrepresented in the Dawson collection in the Peter Redpath Museum and specimens have not been available for comparison.

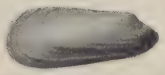


Aviculopecten cf. acadicus Dawson. Cape le Trou, Grindstone I.

Modiola pooli Dawson?

Cf Modiola pooli Dawson. Acadian Geology, p. 301, fig. 100, 1878.

These specimens, while larger, may be identical with M. pooli Dawson. The Shubenacadie specimens seem slender, but if they were increased to the size of these might be identical. The specimen figured is a cast and has been compressed and distorted, producing the effect of a posteriorly placed beak and a depression beneath it which it did not possess.



Modiola pooli Dawson. Cape le Trou, Grindstone I.

Sanguinolites insectus Dawson?

Cf. Sanguinolites insecta Dawson. Acadian Geology, p. 303, fig. 196, 1878.

The specimen from Grindstone island differs from Dawson's figure in not contracting quite so rapidly toward the beak. Since the beak of Dawson's specimen and of ours are both missing it is impossible to say whether or not they are specifically identical.

Euomphalus exortivus Dawson?

Cf. Euomphalus exortivus Dawson. Acadian Geology, p. 309, fig. 118, 1878.

Mold of specimen only, except a flattened section of outer whorl. It is clearly related to the above species, but is much larger, being nearly twice the size.

It differs from E. sulcifer angulatus Girty, from the Guadalupian in being larger and having the sulcus more nearly in the center of the whorl.

Gastropoda, 2 species, all minute, too poorly preserved to identify.

Gastropod, a large Pleurotomaria-like species, too poorly preserved for identification.

Conularia planicostata Dawson

Conularia planicostata Dawson. Acadian Geology, p. 307, fig. 117, 1878.

Cast of specimen agreeing in all essential characters with Dawson's species.

Conularia sp.

Fragment of another species, too poorly preserved to identify. It is quite slender with about 18 or more ribs in 5 mm. Though poorly preserved, the ribs appear to have been crenulated. Striae coarser and more distant than C. micronema Meek, somewhat like C. sampsoni Miller, but less obtuse. Striae more distant than in C. subulata Hall.

This species may be the variety "novascotica" mentioned by Dawson as named by Hartt, but it is uncertain. It does not seem to belong to any other American species.

Orthoceras sp.

Cavity formerly occupied by specimen.

Endolobus avonensis Dawson?

Cf. Nautilus avonensis Dawson. Acadian Geology, p. 331, fig. 124, 1878.

Endolobus avonensis Hyatt. Proc. Amer. Phil. Soc. 32:536, pl. 8, fig. 36–39, 1895.

Represented by a poor cast, small and distorted. The septa and siphuncle not shown. The dorsoventral diameter of the outer whorl seems relatively large for the Windsor species.

Endolobus? sp.

Several small specimens in concretions which do not admit of specific identification; only camarate portion preserved. Septa extremely convex, suture apparently simple and siphuncle placed very near the venter.

Gastrioceras? sp.

A large shell of which the cast of the living chamber is preserved and some of the outline of what may have been the camarated portion. From the characters shown little can be determined. It has a section corresponding roughly to some of the very large angulate, subnodose members of the genus. Umbilicus is very wide. Transverse diameter 52 mm; about a half the whorl from the aperture 41 mm. Diameter of umbilicus 26 mm.

Nodosinella clarkei nov.

Shells long, slender, branching, nodose, usually nearly straight. Test thick, imperforate so far as can be determined. Nodes well defined, quite as wide as long in all specimens sufficiently exposed to show full diameter. Diameter 1 mm, 6 or 7 nodes in 5 mm. Shells apparently monothalamous. In sections cut deep enough to avoid the sharp, keel-like edge of the constriction between chambers no septa are distinctly shown. No indubitable septa seen.

Nodosinella clarkei nov. x 1.5. Loose at Grand Entry

Remarks. This species appears to be related to N. (Dentalina) priscilla Dawson,[1] but differs in being 1 mm in diameter instead of a fortieth of an inch, and the modes are wider than long instead of being considerably longer than wide, and the test is thicker. In all these respects it agrees closely with N. digitata Brady. Our specimens differ from material of either species as described and figured, in branching rather liberally. It would seem to be impossible that the great masses of specimens mentioned by Dawson as occurring in the Windsor limestone, even though they were fragmentary, did not include branching forms. None of our specimens show the plane base indicated by Brady for the British species. The shells are 1 mm in diameter while Brady's specimens varied from 1 to 2 mm in diameter.

These tests are uniformly about a millimeter in diameter, except where a segment is enlarged to give off two or more branches, while Brady's species frequently reach a diameter of 2 mm. The tests in thin section under the microscope appear to be nearly homogeneous with a little rusty coloring. No indication of foramina is visible. Considering the very fine calcareous character of the matrix their presence in the tests originally seems improbable. From the state of preservation it seems questionable if they could be referred to the Lagenidae as suggested by Spandel[2] and others. While a larger amount of material may demonstrate the presence of the characters of this family, I am inclined to leave the specimens in Brady's genus since the ramose character of the species seems incompatible with such shells as Nodosaria.

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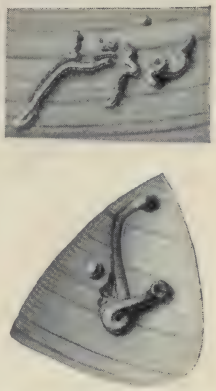
[1] op. cit. p. 285.

[2] Die Foramen. des Deutschen Zechs. etc. p. 6, 1898.

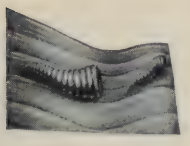
Serpula? infinitesima nov.

Minute, highly contorted, anastomosing tubes which, when highly magnified in cross light, are nodose in appearance owing to rapid contractions and expansions of the shell. Diameter of tubes .1 mm, attached throughout their length to the shell of Composita dawsoni (Hall and Clarke) and other species of brachiopods.

Remarks. This species appears, on other shells, to live quite as largely within the shell as upon it. When it appears at the surface it has the characters mentioned above. It may be straighter within the shell than when partially at the surface. It seems to be partial to the shells of Martinia glabra. It is probable that it is not a Serpula at all. Several shells of the collection show the effects of this borer though the tests it secretes are gone.



Serpula infinitesima nov.
Showing (above) the nodose and contorted form (x 10) and below the tube partly buried in the shell (7)



Cornulites? annulatus Dawson?
Oyster basin, Coffin I.

Cornulites? annulatus Dawson?

Cf. Serpulites annulatus Dawson, op. cit. p. 313, fig. 131.

Specimens much smaller than Dawson's and with coarser marks, otherwise typical.

Stenopora? sp.

An immature specimen of the S. signata type, or what seems as probable, a form of Lioclema with relatively few meso pores. Encrusting form upon Composita dawsoni (H. and C.)

Specimens small, encrusting; zoecia varying from elongate where crowded to ovate; acanthopores rather numerous, elevated, largest ones at the angles of the zoecia; mesopores rather numerous, about eight being found in the walls surrounding a single cell, some much larger than others, except at zoecial angles, never in two rows, triangular to subcircular. Five zoecia in 2 mm. Interspaces fairly thick.

One other specimen still smaller than this was found.

Lingula eboria nov.

Shell small, extremely thin, elongate elliptical, twice as long as broad, moderately convex for these shells, especially in umbonal region, posterior end somewhat more narrowly rounded than the anterior but not angulated. Larger growth lines apparently with thicker shell than the intermediate spaces which show very faint concentric marks.

Lingula eboria nov. Both valves in opposition. Oyster basin, Coffin I.

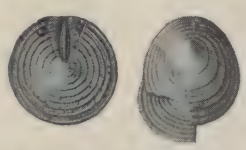
Dimensions. Length, 3.5 mm; width, 1.8 mm. Greatest diameter near the middle of the shell.

Remarks. This shell is very similar to L. ligea Hall, from the upper Hamilton, but is less pointed at the beak and more tapering anteriorly and does not appear to be thicker at the margin. This might be governed, however, by the occurrence of the thickening of the shell at the growth stages.

It is less acute posteriorly than the figure of a shell identified as L. membranacea by Herrick, but it is very closely related to it, if not identical with it. It is closely related to L. albipinensis, as figured and defined by Girty from the Moorefield shales. It is also a close relative of L. parallela Phillips.

Orbiculoidea limata nov.

Shell small, extremely thin; pedicle valve nearly flat and almost circular, sometimes slightly elongate longitudinally; aperture reaching about half way to the periphery, narrow. Brachial valve with beak moderately elevated and located well toward posterior margin. Surface marked with strong, thick circles of shell between which are small, faint concentric marks.



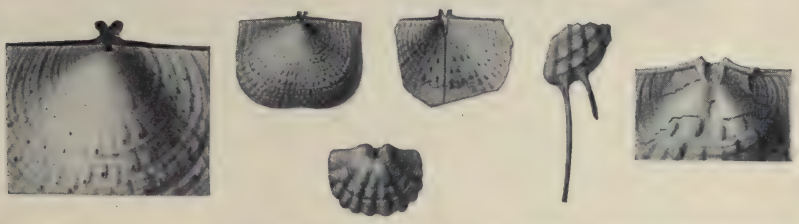
Orbiculoidea limata nov. Pedicle valve x 4. Brachial and pedicle valves x 3. Oyster basin, Coffin I.

Dimensions. Length, 5.75 mm; beak, 4 mm from posterior margin.

Strophalosia nebraskensiformis nov.

Shell of medium size, subquadrate. Immediately beneath the beak of the brachial valve, viewed externally, is a minute convexity back of the umbonal concavity of the valve. Valve convex in central portion, and between the ears and the central part two slight concavities lie either side of the anterior median convexity. Interior of valve with a long median septum reaching nearly to the front of the

valve, forked at its union with the cardinal process, inclosing a deep pit immediately above the convexity of the other side of the valve. Process bifid when viewed from below as shown in the impression. One specimen suggests the possibility of a trifid proboscis. The surface is marked by coarse radiating striae which are alternately interrupted giving it the appearance of an ornamentation of elongated, alternating pustules to which occasionally very long, capillary spines were attached. Little is known of the form of the pedicle valve.



Strophalosia nebraskensiformis nov. In upper row, at left, interiors and exteriors of the valves, with enlargements; below is a very young specimen, pedicle valve (x 10), with scar of attachment and a fragment of a larger shell showing marginal spines, Oyster basin, Coffin I.

One minute young specimen shows the attachment at the beak very clearly as does the beak of another specimen several times as large. In both cases the scar is so small that the specimens must have been attached only by the spines or was free in the adult stages. Surface of this valve ornamented as in the other.

Dimensions. Brachial valve; length, 14 mm; width, 17 mm; length of hinge about 18 mm.

Remarks. The surface ornamentation of this shell is remotely suggestive of Productus nebraskensis Owen. It appears, however, to be a true Strophalosia, the area of the hinge in the brachial valve being small but distinct. It remotely resembles S. truncata Hall of the Devonic.

Beecheria davidsoni Hall & Clarke?

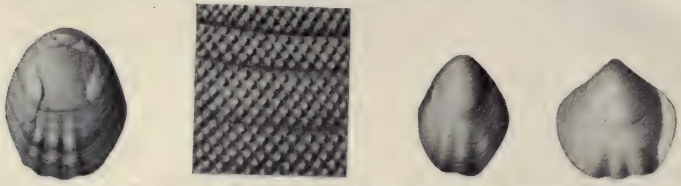
Beecheria davidsoni Hall and Clarke. Intr. Study Brach., pt. 2, pl. 54, fig. 1–3, 1894; Pal. N. Y., 8, pt 2, pl. 79, fig. 33–36, 1895; 14th Ann. Rept. N. Y. State Geol., p. 372, pl. 14, fig. 5–7, 1897.

A few poor specimens which may be referable to this species.

Hemiptychina? waageni nov.

Brachial valve of medium size, quite convex, broad and short, triplicate anteriorly, length exceeding the width, though the specimen is somewhat flattened. Anterior quarter of the shell slightly flattened and occupied by three rounded wide plications. Beak obtuse but sharply defined. Shell very minutely and sometimes

irregularly punctate. Surface plain except for indistinct growth marks. The length and width of the specimen as it lies on the slab is 16.5 mm. The number of plications seems to vary.



Hemiptychina ? waageni nov. Two ventra and one dorsal valve, with enlargement of the surface. Oyster basin, Coffin I.

Pedicle valve subovate in outline, longer than broad, convex, widest somewhat in front of the middle. Beak rounded, apparently incurved; postlateral margins but slightly arcuate, passing into the rather strongly rounded antelateral edges; anterior somewhat produced, convex in outline. Little indication of shell having possessed fold or sinus. Six plications occupy the anterior two-thirds of the shell, the four lateral ones being rather indistinct and all of them coarse and broadly rounded. Fine concentric lines mark the surface of the shell together with broader concentric undulations. Interior unknown. Shell symmetrically punctate as in Dielasma.

Dimensions. Length, 15.5 mm; width, 13 mm.

Remarks. This shell possesses the peculiar punctate character of Dielasma, but in form it is similar to Hemiptychina or some specimens of Notothyris described by Waagen. The punctations are evidently coarser and more symmetrically arranged than in Waagen's specimens of Hemiptychina, but the great disparity of the horizons may account for this, especially if the genus sprang from Dielasma or from the same radicle. The globular form of Dielasmina is not suggested by our specimen. In this respect our specimen resembles more closely Hemiptychina, especially H. sparsiplicata Waagen. So long as its internal characters are unknown it may as well rest in this genus as in any. I know of no American Mississippian or Pennsylvanian species resembling it.

Martinia glabra Martin

Spirifera glabra Davidson. Quart. Journ. Geol. Soc. Lond., XIX, p. 170, pl. 9, fig. 9, 10; 1863.

Spirifera glabra Dawson. Quoted by Dawson. Acadian Geology, p. 291, fig. 89; 1868.

Martinia glabra? Girty. U. S. G. S. Bull. 439; p. 70, pl. 9, fig. 9–11.

Specimens of this species are common in the gray shales of Coffin island, at Oyster basin.

It is interesting to note that Girty finds this species, or one practically inseparable from it, in the Moorefield shales of Arkansas.

Composita dawsoni (Hall & Clarke)

Athyris subtilita Davidson. Quart. Journ. Geol. Soc. Lond. 19, p. 170, pl. 9, fig. 4, 5, (not A. subtilita Hall) 1863. Quoted by Dawson, Acad. Geol., p. 290, fig, 88a-c, 1868.

Seminula dawsoni Hall. 13th Ann. Rept. N. Y. State Geol., p. 652, pl. 47, fig. 32–34, 1894; 14th Rept., p. 359, pl. 9, fig. 14-16, 1897.

The specimens referred to this species are not very abundant, are distorted and poorly preserved. It can not be stated that they certainly belong to the species to which they are here referred, though there appears to be little doubt of it.

Nucula iowensis White & Whitfield var. **magdalenensis** nov.

Shell minute, triangular in outline, very ventricose. Beaks nearly terminal posteriorly, little elevated; dorsal border slightly arcuate, sloping forward to the pointed anterior end which rounds abruptly into the nearly straight but gently convex ventral margin making an abrupt turn upwards at the posterior extremity. Posterior margin truncated from beaks to ventral extremity. Surface marked by regular concentric crenulated striae separated by depressions of about equal width.

Nucula iowensis var. magdalenensis nov. Cardinal view x 5. Surface of left valve x 4

Dimensions. Length, about 4 mm; height, 2.2 mm; convexity, 2 mm.

Remarks. Winchell's description of N. iowensis is followed by these remarks:

"The shell appears to be subject to considerable variation at different stages of growth; young specimens often being distinctly triangular, with the posterior end very short, and the basal margin but little arched, while the old specimens are subovate and the posterior end more prolonged. This description of young individuals tallies very closely with the species in hand which may be a variety of Winchell's species. All our specimens are minute.

While resembling the description of the young of Winchell's species, our specimens are very different from the adult forms. His specimens are larger than the largest of ours. The dimensions above given are for the largest specimen.

Our specimens differ from N. houghtoni Stevens in being more elongate with straighter ventral margin, as they do from N. parva McChesney. It is related to N. rectangula

McChesney, but has its beaks less elevated and is relatively longer. It is very closely allied to N. tumida, but is more pointed anteriorly. In form it resembles N. illinoisensis Worthen, but has strong crenulated surface marks instead of being nearly glabrous. It differs from all of these in its minute size and probably in its surface markings.

Nucula sp.

Shell of moderate size for Nucula, beaks scarcely passing above the hinge. Shell inflated below the hinge, mostly broken away. The surface marks consist of very fine, even, closely spaced filiform striae as shown on cast. Specimen originally about 10 mm long, 5–6 mm high and 5.5 mm thick.

Parallelidon? sp.

A shell apparently belonging to this genus, with long straight hinge, elongate posterior border and nearly straight ventral margin so far as can be told from the compressed specimen. The anterior margin appears to pass obliquely forward and then downward, sharply curved from the end of the hinge. Surface marked with fine, regular growth lines and a few very indistinct concentric undulations.

Dimensions. Length, 21.5 mm; height, 7 mm; length of hinge, about 12 mm.

Remarks. This specimen is hardly well enough preserved to identify or describe specifically in this genus where slight variations of form are so vital.

Schizodus cuneus Hall?

Cytherodon (Schizodus) cuneus Hall. Palaeontology N. Y. v. 5, pt 1, Plates and Explanations, pl. 75, fig. 29, 30. 1883.

Schizodus cuneus Hall. Idem. p. 458, pl. 75, fig. 29, 30, 1885; Herrick, Bull. Denison Univ., Ill., p. 65, pl. 5, fig. 15, 1888; Geol. Surv. Ohio, 7, pl. 21, fig. 15, 1895.

Shell small, ovate-cuneate; length about one-fourth greater than the height; basal margin broadly curved. Post-inferior extremity angular. Posterior margin very obliquely truncate. Cardinal line equal to about half the length of the shell. Anterior end short, contracted just below the beak and regularly rounded below.

Valves gently convex below, becoming gibbous in the middle.

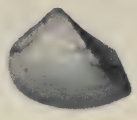
Beaks at about the anterior fourth, moderately prominent. Umbonal slope angular, defined, extending to the post-inferior extremity.

Surface marked by fine fasciculated striae, the remains of which are still preserved in the cast.

The anterior muscular impression is comparatively large and strongly limited on the posterior side. The impression of the strong cardinal tooth is preserved beneath the beak.

Two specimens measure respectively 20 and 22 mm in length, and 15 mm in height.

Remarks. In our specimen it will be noted that the hinge is relatively longer than in the above original description, and, if the specimen represented by figure 30 is excluded, the posterior truncated margin is proportionately shorter. Including this figure, our specimen is intermediate between the two. The beak appears to be quite as prominent in the Coffin island specimen and the shell somewhat smaller.



Schizodus cuneus Hall? Left valve. Oyster basin, Coffin I.

Schizodus denysi nov.

Shell small, subrhomboidal, rather compressed. Beaks elevated, pointed. Posterior margin very obliquely truncated; postventral extremity angular; ventral border convex throughout, curving more rapidly toward the front; front border convex except for constriction just in front of beak; umbonal ridge angular. The valves are thickest below the beaks which are well anterior. Surface with lines of increment indistinctly preserved on the cast.

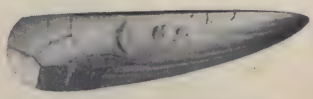
Schizodus denysi nov. Oyster basin, Coffin I.

Dimensions. Length, 12.5 mm; height, 9 mm; length of hinge, 12.5 mm.

Remarks. This shell is related to several Mississippic forms. It is relatively longer than S. trigonalis, while the posterior margin is more oblique than in shells of the S. wheeleri type. Both the shell and the hinge are longer than those features in S. curtiformis.

Aviculopinna egena nov.

Shell small, broad for its length. The hinge appears to be somewhat arcuate. Shell widening rather unevenly along the ventral margin, rather rapidly at first, then more slowly in some specimens. Posterior margin truncato-convex, possibly slightly sinuate in some specimens. Surface marked by wrinkles of growth which are at right angles to the hinge passing directly downward or a very little



Aviculopinna egena nov. Oyster basin, Coffin I.

backward as they fall to the central part of the valve when they turn gradually forward becoming more and more nearly parallel with the hinge.

Remarks. This species lacks the sharply raised, evenly spaced, threadlike lines characteristic of the Mississippi valley species. In this respect it resembles the British species, but the posterior margin is truncated at about right angles to the hinge, instead of being very oblique.

One specimen, the largest, appears to have a radiating ridge nearly parallel to the hinge and just below it, but it is probably the hinge of the slightly displaced opposite valve showing on account of the compression of the specimen.

Aviculopecten debertianus Dawson

Aviculopecten debertianus Dawson. Acadian Geology, p. 307, fig. 116, 1878.

One specimen, hardly half a valve, reproduces almost perfectly the characters of this species.

Pleurophorus? sp.

A single poorly preserved specimen, rather short and stout for shells of this genus, seems to possess the characteristic ridge of shell which produced the usual depression in the cast in front of the beak.

Cast short, convex, elongate-subquadrate; hinge nearly as long as the shell, straight; posterior end truncated almost at right angles to the hinge and extending to the ventral margin, which is straight, rounding rather gradually into the sharply curved anterior margin. Umbonal region quite convex, beaks incurved, and placed well forward. Umbonal ridge prominent and subangular.

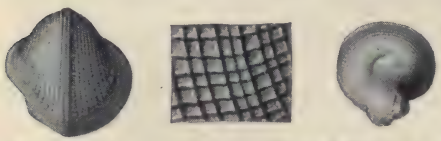
Dimensions. Length, 10 mm; height, 6 mm.

Pelecypoda sp.

Three or four species of minute, poorly preserved pelecypods.

Bucanopsis perelegans White & Whitfield var. **minima** nov.

Shells minute, strongly reticulated. Band with a narrow line on either side, and a thin elevated line along the middle. Surface covered with fine, filiform revolving striae, evenly spaced, 16 or 17 to a millimeter and transverse lines of similar character about 10 to a millimeter, showing a tendency to develop nodes at the intersections with the



Bucanopsis perelegans White & Whitfield var. minima nov. Shells x 5; surface x 10. Oyster basin, Coffin I.

revolving striae. These striae turn backward somewhat on approaching the band. The largest transverse diameter of the shell is 3 mm. Other dimensions unknown.

Remarks. This shell is very closely related to B. p e r e l e g a n s from the Kinderhook but differs in its minute size, crowded and evenly spaced revolving and transverse lines. Three specimens observed are all about the same size; some however show the lines somewhat more distant than the specimen described.

Euphemus? sp. Weller

E u p h e m u s ? sp. Weller. Trans. St Louis Acad. Sci., 9, 2, p. 40, pl. 5, fig. 10, 11, 1899.

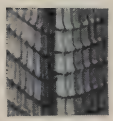
Specimen minute, umbilicated. Dorsal part of the shell compressed, but it appears to have been semiglobular in form. Region of the band is obscured. Six widely separated revolving lines shown on half the shell. No growth lines perceptible. Shell 3.75 mm across, with a thickness of 2.5 mm.

E u p h e m u s ? sp. Weller. Oyster basin, Coffin I.

Remarks. The outer portion of the last volution is missing but it appears to be the same shell described and figured by Weller from the Vermicular sandstone.

Sphaerodoma? sp.

A poor mold of a large specimen of about four whorls that may belong to the genus. It has a height of about 20 mm, and a diameter of the body whorl of about 15 mm.



C o n u l a r i a s o r r o c u l a nov. Oyster basin, Coffin I.

Conularia sorrocula nov.

Shell of small size, pyramidal, enlarging at an angle of 20°. Edges of shell round inward, producing an impressed angle; surfaces nearly flat; mesial furrow scarcely impressed; anterior ends of sides arched forward in the center, leaving rather deep angles at their union. Transverse striae arched forward on sides, frequently meeting, sometimes interrupted at the mesial furrow; ten in 5 mm, on the upper part of the shell, more than twice as many near the base, strongly crenulated by the crossing of longitudinal wrinkles which appear coarser and farther apart near the angles; crenulations keel-like, 10 to 13 in 2 mm.

Dimensions. Length, 28 mm; width of valve at aperture 10 mm, incomplete at base.

Remarks. Differs from C. newberryi in having its striae and crenulations more closely spaced and an angle of divergence of 20° instead of 10°.

Orthoceras sp.

Shell small, regularly tapering at an angle of 9½° in the uncompressed part. Septa about a millimeter apart near the middle, which is about a fifth the diameter at that place.

Dimensions. Length, 43 mm; width, 8 mm (flattened considerably).

Orthoceras sp.

Fragment of large shell with edge of living chamber. Different species from preceding. Septa about 4 mm apart, somewhat more crowded near living chamber. Length of fragment, 43 mm; width, 15 mm; not showing width of shell.

Ostracoda sp.

One or more species of small ostracods occur in the gray shale of Oyster basin, Coffin island.

TABULAR LIST OF MAGDALEN ISLAND FAUNAS

	Oyster basin, Coffin I.	Cape le Trou, Grindstone I.	Nova Scotia limestones
Nodosinella clarkei	x	.....	.....
Cornulites? annulatus	x	.....	x
Serpula? infinitesima	x	.....	.....
Spirorbis sp.	.....	x	?
Rhombopora exilis?	.....	?	x
Stenopora? sp.	x	.....	.....
Beecheria davidsoni	?	?	x
Composita dawsoni	x	.....	x
Dielasma sacculus	.....	x	x
Hemiptychina? waageni	x	.....	.....
Lingula eboria	x	.....	.....
Martinia glabra	x	.....	x
Orbiculoidea limata	x	?	.....
Productus auriculispinus	.....	x	.....
Productus prouti	.....	x	.....
Productus dawsoni	x	x	?
Productus dawsoni acadicus	x	x	?
Productus arseneaui	.....	x	.....
Productus laevicostus?	.....	x	.....
Productus doubleti	.....	x	.....
Productus tenuicostiformis	?	x	?
Productus sp. A	.....	x	.....
Pugnax magdalena	.....	x	?

	Oyster basin, Coffin I.	Cape le Trou, Grindstone I.	Nova Scotia limestones
Strophalosia nebraskensiformis	x	.....	.....
Aviculopecten acadicus	.....	x	x
Aviculopecten debertianus	x	.....	x
Aviculopecten lyelli	.....	x	x
Aviculopinna egena	x	.....	.....
Cardinia subquadrata?	.....	?	x
Edmondia magdalena	.....	x	.....
Edmondia intermedia	.....	x	.....
Edmondia sp. A	x	.....	.....
Liopteria acadica	.....	x	.....
Liopteria dawsoni	.....	x	x
Liopteria sp.	.....	x	.....
Leptodesma borealis	.....	x	.....
Modiola pooli	.....	x	x
Nucula iowensis magdalenensis	x	.....	.....
Nucula sp.	x	.....	.....
Parallelidon dawsoni	.....	x	x
Parallelidon hardingi?	.....	x	x
Parallelidon? sp.	x	.....	.....
Pelecypoda, several small species	x	.....	.....
Pleurophorus? sp.	x	.....	.....
Pteronites cf. latus	.....	x	.....
Sanguinolites insectus?	.....	x	x
Schizodus richardsoni	.....	x	.....
Schizodus cuneus?	x	.....	.....
Schizodus denysi	x	.....	.....
Bucanopsis perelegans minima	x	.....	.....
Euomphalus exortivus?	.....	?	x
Euomphalus? sp. (Cephalopod?)	.....	x	.....
Euphemus? sp.	x	.....	.....
Gastropods, three species	.....	x	.....
Gastropod sp.	.....	x	.....
Sphaerodoma? sp.	x	.....	.....
Conularia planicostata	.....	x	x
Conularia sorrocula	x	.....	.....
Conularia sp.	.....	x	?
Endolobus avonensis?	.....	x	?
Endolobus? sp.	.....	x	.....
Gastrioceras? sp.	.....	x	.....
Orthoceras sp. A	?	x	.....
Orthoceras sp. B	x	.....	.....
Ostracoda, one or more species	x	.....	.....
Total	28	37	.....